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SAN FRANCISCO'S WATER SYSTEM.[1]

BY HERMANN SCHUSSLER.

In the early history of San Francisco there were a number of big fires that destroyed the city three or four times in succession during the fifties, and a general idea took hold of the people that they ought to have water works. But as the community was not properly organized at the time for going into debt, a lot of prominent citizens got together and went on to Sacramento, and, with the aid of some lawyers, framed a law, called the law of 1858, which was passed almost unanimously by the Legislature. That law was passed with a view to encouraging private capital to embark in enterprises of this kind, principally to supply water to Californian municipalities. This law provided, in the first place, a maximum rate of interest that could

Calaveras Creek, One of the Water Sources for the Sunol Filter Beds.

[1]Report of talk before San Francisco Section, American Institute of Electrical Engineers, November 19, 1909.

be charged by a private corporation of that kind. That maximum, at that time, was about 24 per cent a year. I know, when I came here, in 1864, about 18 per cent was paid a year, but, in 1858, the rate of interest averaged about 2 per cent a month. So this law provided that these water purveyors should not be allowed to collect more than 20 per cent a year. That was the maximum. In order to properly regulate the price of water, so that they would not be overcharging the people, and that they would gradually decrease this rate for water as the quantity supplied increased and as the rate of interest would gradually decrease, the law provided for arbitration approximately in the following manner:

The city was to appoint one arbitrator, the respective water company the second arbitrator, and the two should select a third one as an umpire; and, in order to make an agreement compulsory, the law stated that in case of the failure of the two arbitrators to agree upon the third one, then the sheriff of the respective city and county should be the third one, which naturally meant that the majority was then in favor of the city. Under this law, people were found to put in money and to construct water works.

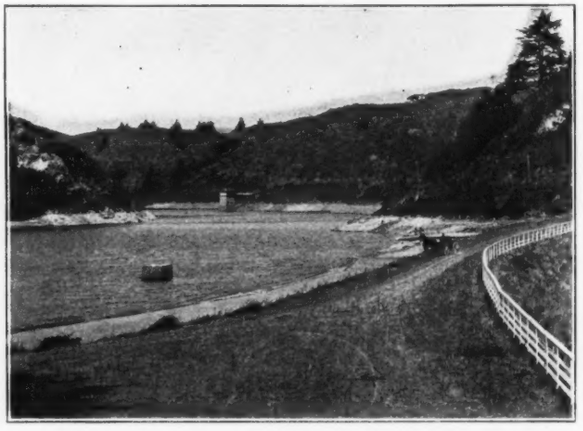
The first company organized for San Francisco brought a little stream, called Lobos Creek, through a flume and tunnel and cement pipe line, around by Fort Point. They brought it to North Beach, to the foot of Van Ness avenue, and put up an old-fashioned pumping station. The engines were bought second hand from an old wrecked steamer, up in Oregon. They were old-fashioned, low-pressure engines, and were connected with four horizontal ordinary piston pumps, and they worked away on those two million gallons a day, which the creek furnished, and forced it up the hill, into two reservoirs, built on Russian Hill. They are still there. One is called Russian Hill reservoir, at about three hundred feet elevation, and the other, Francisco Street reservoir, a little farther north, at about 130 feet elevation.

The city kept on growing, and by the year 1860 or 1861, they found that the city would soon outgrow this quantity of daily supply, that is, the maximum that the creek could furnish, two million gallons a day. So another corporation formed, in opposition to the first one, called the Spring Valley Water Works, and they went to work, under the guidance of a gentleman named Colonel Von Schmidt, a bold and plucky man, who went into the mountains in San Mateo County and bought five or six hundred acres of land, and from there constructed a flume line, on a grade of about seven feet to the mile, two feet wide and sixteen inches deep, that is, the side boards. With that flume and a few tunnels and pipes, he sent the water by gravitation into San Francisco, coming around past Lake Merced. (The company now owns a great deal of property there that has since been purchased.) The flume went through that country to Lake Honda reservoir. From there, two 12-inch cast-iron pipes were laid down Haight street to Market and Buchanan streets, and there they built the Market Street reservoir. That hill has since been cut in two and the reservoir destroyed, by the cutting through of Ridley street.

About that time, the company brought in about two million gallons a day from the San Mateo mountains, and there was no reservoir, except a very small one created by a small earth dam built in the upper end of this valley, called Pilarcitos Valley. The daily demand for water increasing rapidly, the company then looked about to increase its supply.

Just about that time, I happened to be thrown on these hospitable shores, and being young, and having thoroughly studied my profession, they asked me if I would go out into the woods and see what I could make out of it. So I started in with the surveys, got the area of the watersheds, watched the rainfall, with three or four rain gauges, averaged about through the watershed, measured the streams as they ran off from the surface, and so made up my mind that we could get from a country of about four or five square miles, with a very good watershed tributary to this valley, about four or five million gallons a day net.

So they said, "Go ahead," and under the direction of Calvin Brown, we built the first portion of this earth core; ran some tunnels through these hills, and under my subsequent direction built a pipe line across the San Andres Valley; followed the ridge towards San Francisco; then switched off to the northeast and



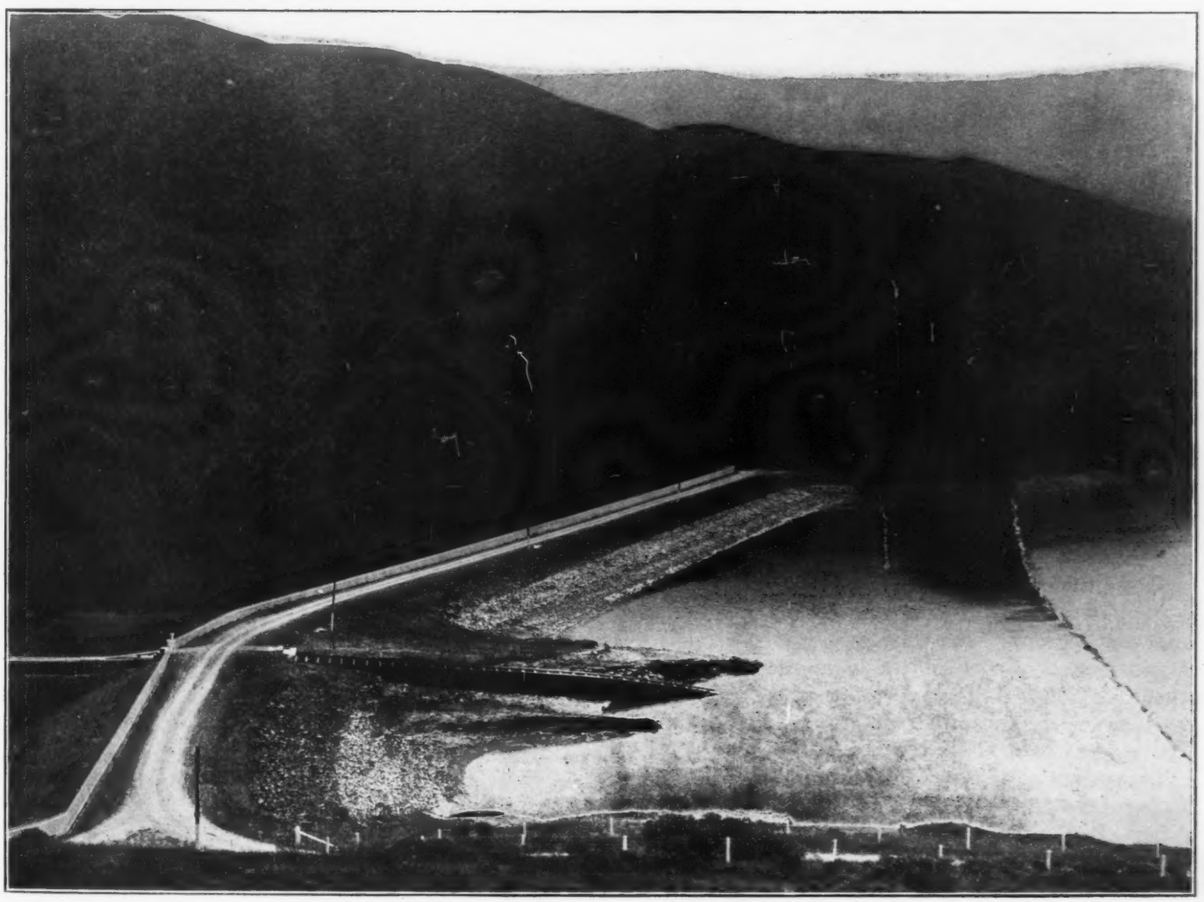
Pilarcitos Dam From the West.

entered the same reservoir at Lake Honda, near the Alms House.

While making this survey for the Pilarcitos pipe line, I noticed, in running one trial line up the San Andres Valley, some level ground, and I changed the route of the pipe line and laid it on the hill, towards town, and we built the pipe line on this second line. But I kept my old notes of the valley line, and found for a distance of nearly three miles that this valley raised but very little, perhaps ten or fifteen feet. So I kept this in mind, and when, gradually, the daily demand for water increased, I asked the executive committee of our board to go out with me and take a look at this valley, privately, but in such a way that we would not be recognized by those eagle-eyed farmers, I showed it to these gentlemen: Mr. William F. Babcock, Lloyd Tevis and John Parrott, and they made up their minds that there was something in it. So they set an agent to work, and bought up this valley, with most of the watershed—another four or five square miles.

Then I started in, about 1868, and built the San Andres dam, which is also an earth dam, with a clay core, about 700 feet long, 95 feet high, and has a slope

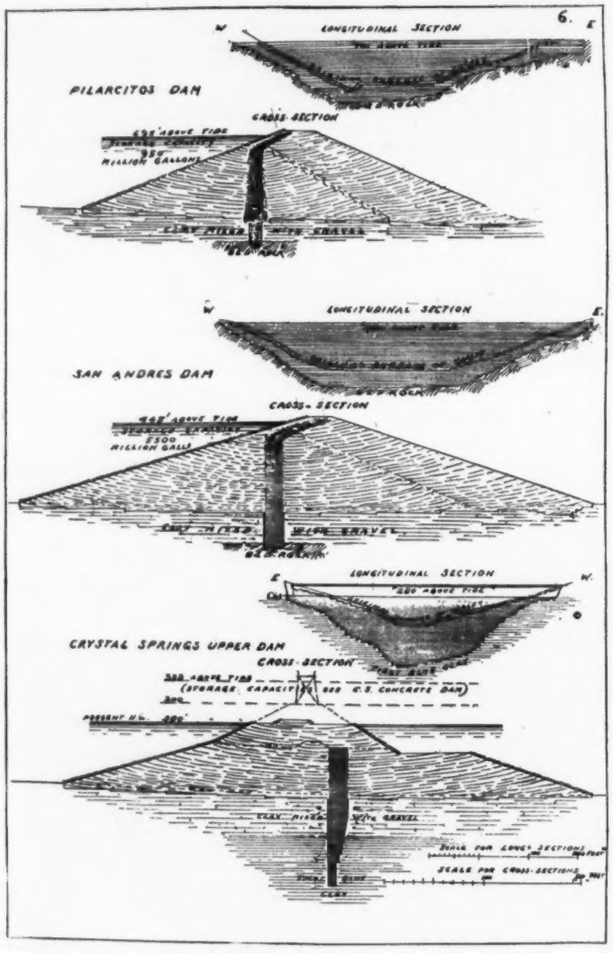
Pilarcitos Dam.



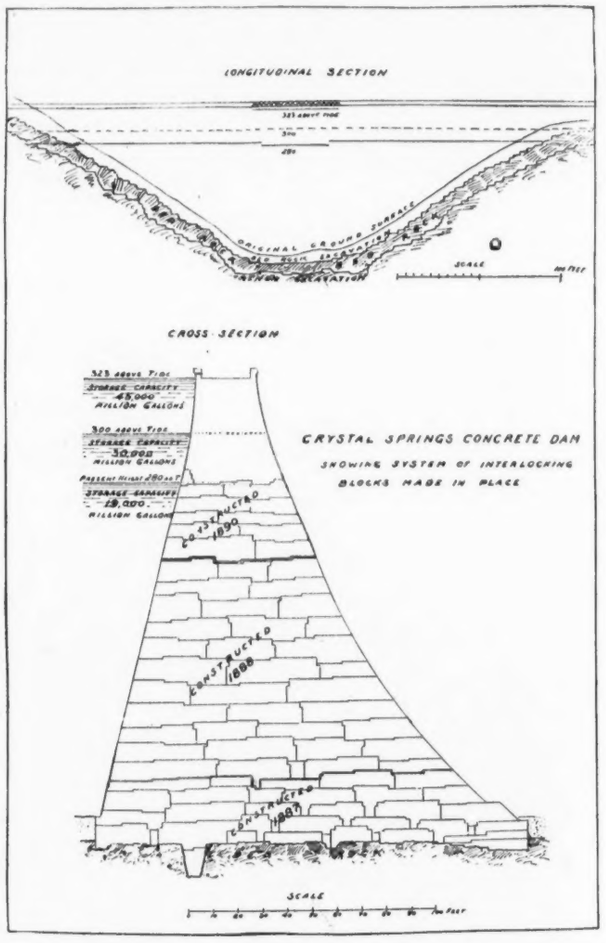
San Andres Dam.

on the water side of three and one-half to one, and, on the dry side, three to one. It was well built, of first-class materials, in thin layers, thoroughly packed, watered and consolidated; and, in our late calamity, the earthquake shook this dam to such an extent that it moved with its foundation seven feet to the northwest bodily, the earthquake fault going through the easterly end of it. The puddle pit and the embankment were so well built that it did not tear through, but bent, like a flat letter S and remained perfectly tight.

The same earthquake followed the main ridge for about seven miles, and tore it lengthwise, and destroyed the 30-inch Pilarcitos pipe line there.



Longitudinal and Cross Sections of the Clay Dams of the Peninsular System.



Longitudinal and Cross Section of Crystal Springs Concrete Dam.

The growth of consumption continuing constantly and regularly, and the company having much money invested in the enterprise by that time, had to keep on and get more property and build more reservoirs and works. So I located the dam at Crystal Springs (which is now 145 feet high and will eventually be 188 feet high).

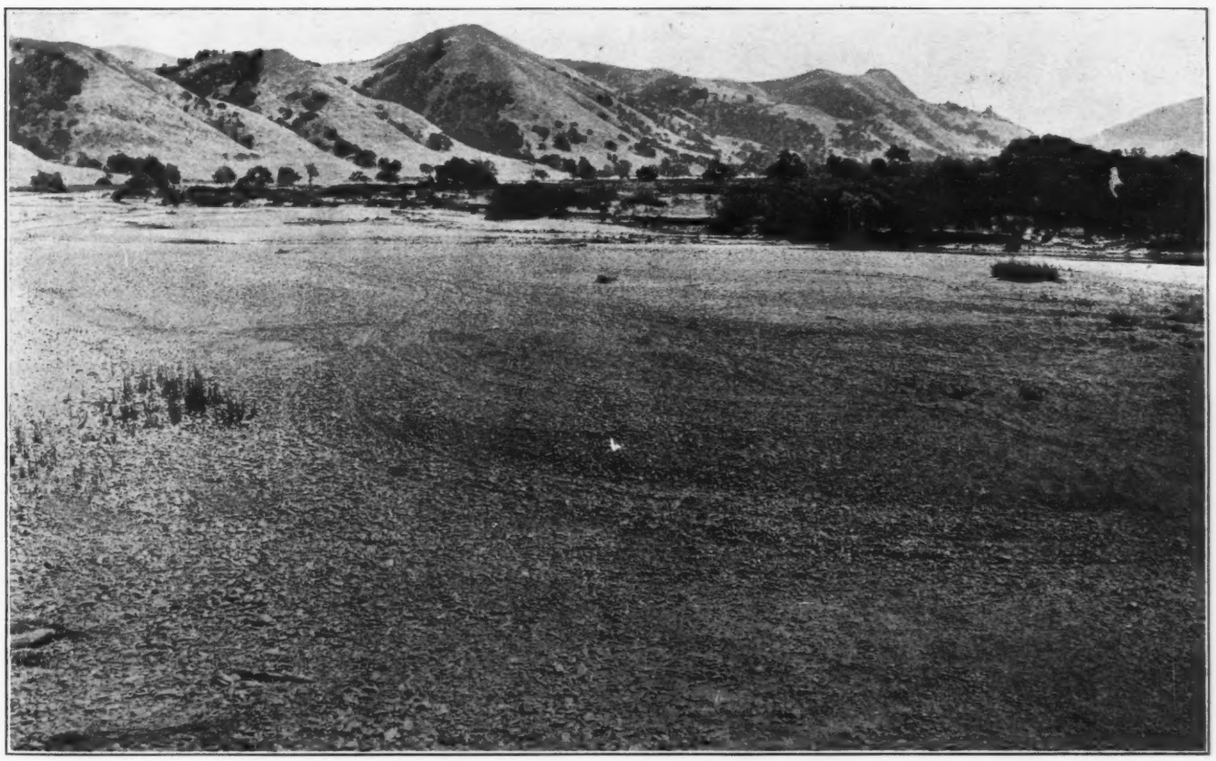
There was a great scarcity of good clay for earth-dam purposes and, besides, I was a little afraid to go that high with an earthen dam, so I made up my mind to build it of stone and cement; in looking about for good quarry stone (we had numbers of men scouring the hills for quarries, and we could not find any rock large enough for stone masonry) we found a very good, hard, indurated sandstone, but so small and broken up that the biggest piece we could find was about the size of a man's head. So I concluded to design concrete machinery on a big scale, and crush rock and wash it, and mix it, and make a concrete dam, which was done.

I also, at the same time, recommended the development of the Alameda Creek system, as, except for the coast streams, that was the only nearby and most available source we could get. So we purchased more property on Alameda Creek. I had reported on some of that property many years before that, but at that time the company would not listen to me, because it was too far off in the future.

In the latter part of the eighties, the company decided to purchase the balance of Alameda Creek, with its water rights. Then I immediately went to work and constructed the submarine pipes across the bay, and had them ready in the fall, and then laid about 22 miles of 36-inch pipe from this creek to the Belmont pumping station. We built that at the same time. We laid about five more miles of pipe to Burlingame, and connected it with the Crystal Springs 44-inch pipe, and thus sent the water to town, and got here in time to keep it from running dry. That is a short history of the way that was brought about.

Meanwhile, as the consumption kept on growing, I advised them to keep on buying more land, and as,

Calaveras Valley, the Site of the Proposed 30,000 Million Gallon Reservoir for the Alameda System.

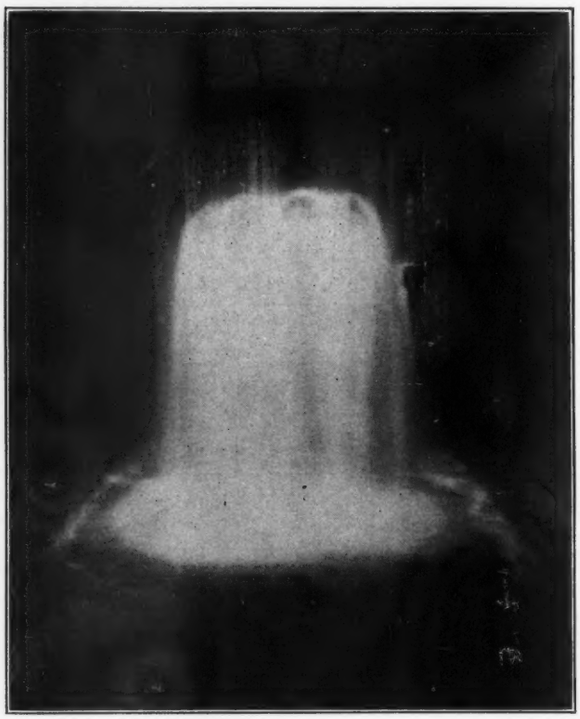


Dry Gravel Beds in Sunol Valley Into Which Calaveras and Other Creeks Sink and Under Which There Is the Company's System of Filter Galleries.

little by little, the feeling of the public became more and more opposed to this enterprise, we looked for other customers; and, naturally, the company concluded—(as the City of San Francisco wants to go to the mountains for water, which they have been advised to do by their engineers)—that the company would buy as much of this property as they could possibly afford to buy, and increase its works, with a view to supplying San Francisco primarily. But, if San Francisco does not want it, then there is a fine region to supply with water, in the succession of towns, starting with Niles, Haywards, San Lorenzo, San Leandro, Alameda, Oakland and Berkeley. On the west side of the bay, the population is also rapidly increasing, and badly in need of water, and upon the basis of these alternatives, our people went on and spent large amounts of money in buying between 30 and 35 thousand acres of land on the Alameda Creek system.

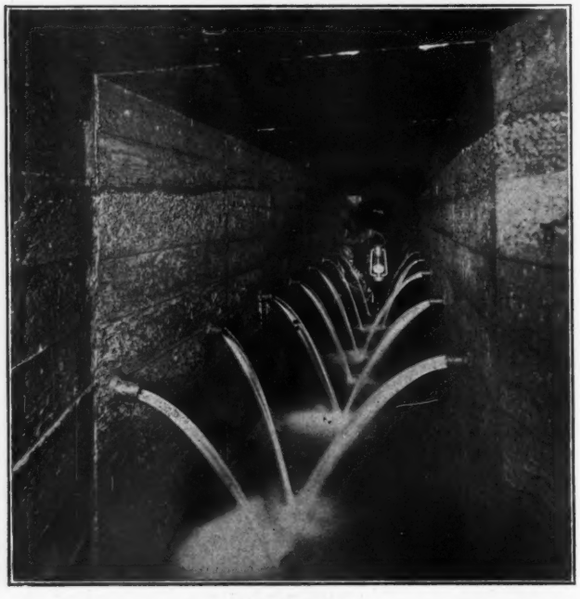
The main feature of this purchase was that the watershed controlled by the outlet of this Niles Canyon, was about six hundred square miles in extent, running almost from Mount Diablo, via Altamont Pass, beyond

Mount Hamilton, and back again to the place of beginning. We also, at the same time, by purchasing these properties, bought the water-rights all the way down to the salt water.



Main Filter Gallery, Water From Two Branch Galleries Discharging Into It Through the Roof Arch.

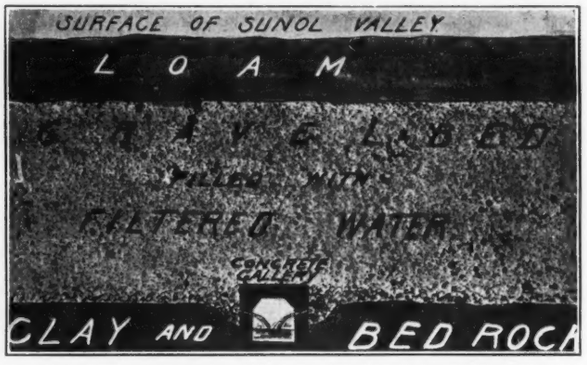
Meanwhile, the city had passed through various phases in regard to the water question. As I stated a while ago, the law of 1858 had been passed for a fair basis of arbitration, and as that met all require-



Branch Filter Gallery.

ments, and as our people did not take advantage of the law, and did not collect 20 per cent. The dividend they paid was 9 per cent. At a time when the local rate of interest was 15 to 12 per cent, under the action of this arbitration committee (which was fairly administered), they gradually reduced the rate of interest paid to the stockholders to 6 per cent a year.

Then the general agitation, that the people should run all public works themselves, brought about the New Constitution. The New Constitution wiped out the law of 1858. It wiped out the arbitration clause. It put the entire arbitration into the hands of the purchaser—the city, or into those of its representatives—the Supervisors. And from that time on the trouble commenced. That was about the year 1880. Fortunately, there were enough fair-minded people elected (they usually had very good Mayors in those days), and although the Mayor did not have much to say about the water rates, his influence was more or less felt; so that during the entire twenty years in which the new Constitution was the controlling factor of our destinies, it came to be understood that for the amount of money expended by the corporation for betterments, being obtained by the sale of stock or bonds, it should be entitled, owing to the more or less degree of risk in the enterprise, to not less than 6 per cent interest; and, at that ratio, it was interpreted, until about toward the end of the nineties. Then a new element came into the city government, and the result of this new element was the new Charter.



Ideal Cross Section of the Gravel Beds in Sunol Valley Showing the Main Filter Gallery.

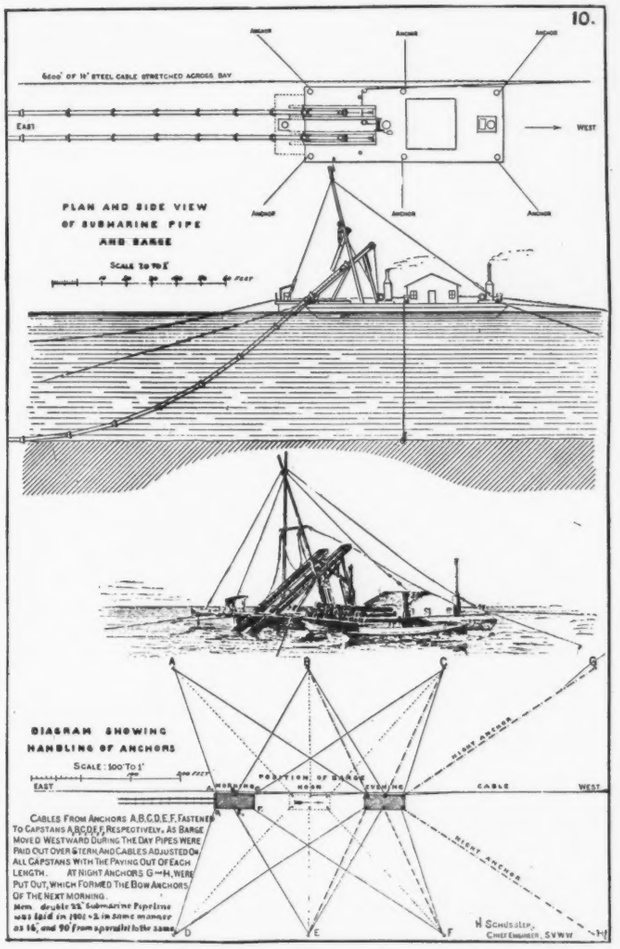
Now the new Charter did not change the new Constitution, because it was made under the new Constitution. In order to offset the heretofore fair interpretation of the new Constitution, during the past twenty years, the new Charter had a clause embodied in it, which made it a predominating factor that the city should own its own municipal water supply, and it gave, as you know, the various ways in which to obtain a water supply. Then there were business men in the city who said: "This present water supply will form a very good foundation for a future extension from the mountains, or from anywhere else. Let us try to buy it." But, as you know, whenever you want to buy a thing, it takes two people—the buyer and the seller. Now, our people were not particularly anxious to sell. At the same time, judging from the increasing unfairness of the interpretation of this water rate fixing, our people gradually got worn out and tired out, so that several generations of directors gave it up. A good many of them died, or got tired, or moved away.

The sum and substance of it was that the Charter provided that a City Engineer should be appointed,

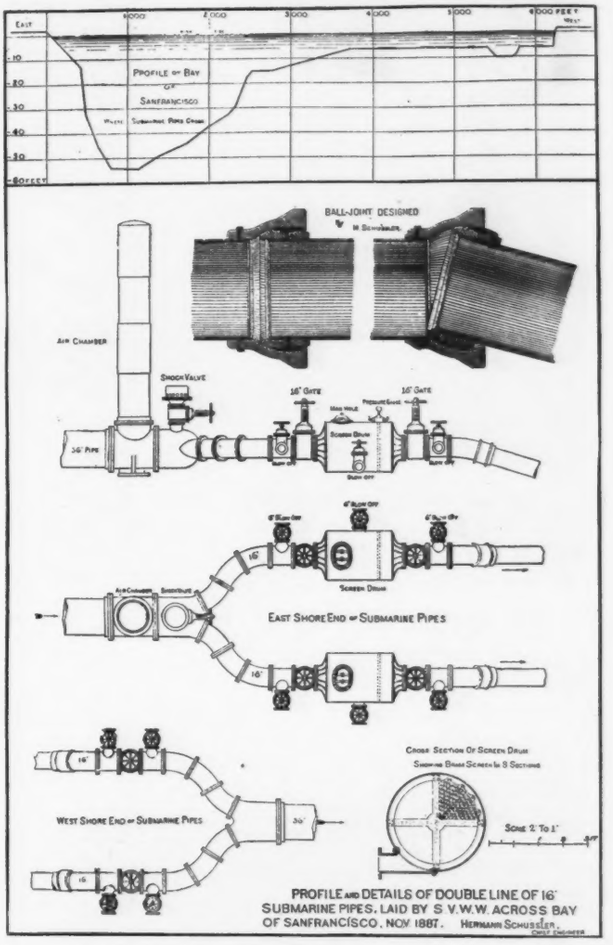
and this City Engineer acted under the Board of Public works. The Board of Supervisors, under the new regime, evidently thought: "What's the use for us to have a City Engineer and a Board of Public Works if we don't use them, with all their experience and skill, to value these Spring Valley Water Works?" They found people who thought they could value the Spring Valley Water Works. I had spent a lifetime there, to find out what it was worth; but when I came with my valuation of forty or fifty million dollars, they laughed at me. I based the value of these works and properties upon not only what had been expended in the works that had been constructed but also on the possibilities of their future development, when compared with the expense of the nearest scheme from anywhere else, of equal capacity, degree of safety and chances for future development. It is something like the way merchants sell goods. They approximate or gauge the value or selling price of an article by about what it will cost to bring it in from somewhere else.

I have made a fair valuation of these works and properties. We have now over eighty thousand acres of land, and the water rights to over one hundred million gallons a day, and it is right near home, and I thought that was worth anyway as much as the cost of the same amount of water eventually to be brought from a distance of one hundred and fifty or two hundred miles would cost, even leaving out the element of risk in the additional distance to be traversed.

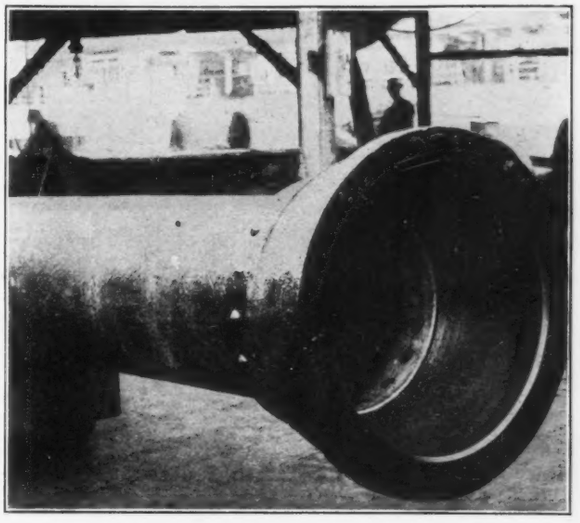
By referring to diagram opposite page 530 it will be seen that in 1875, ten years after I had made a private report to our Board of Directors, in Nov., 1865, that they must some day acquire this Calaveras and Alameda property, the city engaged an engineer from Kentucky, a gentleman named Scowden—an extraordinarily good engineer. He was asked to investigate


10.
PLAN AND SIDE VIEW OF SUBMARINE PIPE AND BARGE
DIAGRAM SHOWING HANDLING OF ANCHORS
CABLES FROM ANCHORS A.B.C.D.E.F. FASTENED TO CAPSTANS A.B.C.D.E.F. RESPECTIVELY. AS BARGE MOVED WESTWARD DURING THE DAY PIPES WERE PAID OUT OVER STERN, AND CABLES ADJUSTED ON ALL CAPSTANS WITH THE PAYING OUT OF EACH LENGTH. AT NIGHT ANCHORS G—H, WERE PUT OUT, WHICH FORMED THE BOW ANCHORS OF THE NEXT MORNING.
H Schussler, Chief Engineer, S.V.W.W.

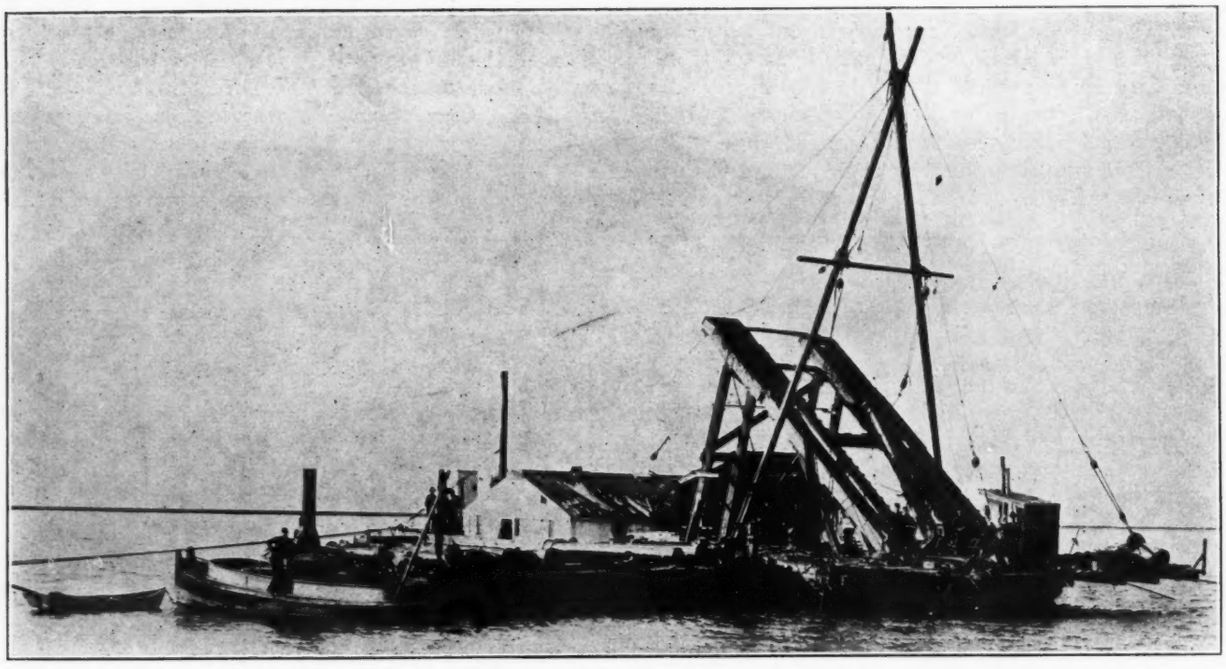
Method of Laying Submarine Pipe.


PROFILE OF BAY OF SANFRANCISCO
BALL-JOINT DESIGNED
EAST SHORE END OF SUBMARINE PIPES
WEST SHORE END OF SUBMARINE PIPES
PROFILE AND DETAILS OF DOUBLE LINE OF 16" SUBMARINE PIPES, LAID BY S.V.W.W. ACROSS BAY OF SANFRANCISCO, NOV 1887. HERMANN SCHUSSLER, CHIEF ENGINEER

Profile and Details of Submarine Pipe Under and On the Shores of San Francisco Bay.



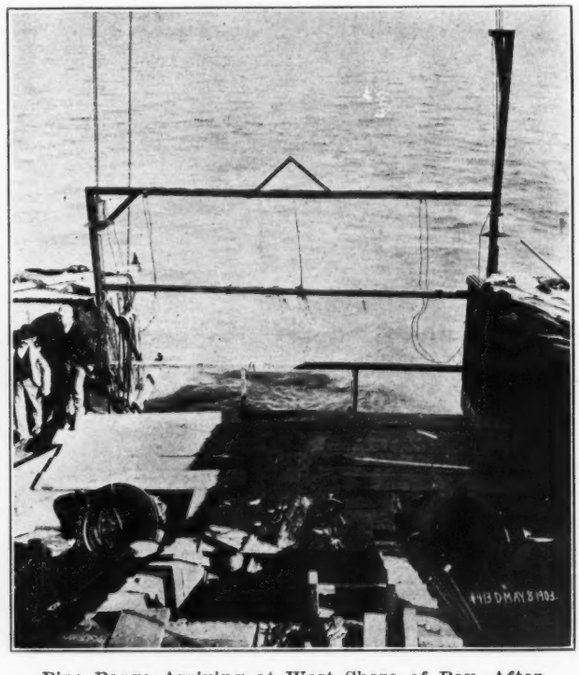
Bell End of Ball Joint of Submarine Pipe.



Pipe-Laying Barge in Operation.

the water question—to investigate every scheme in the Sierra—and he finally said: "That is the place—the Alameda Creek. You can develop something like from 75 to 100 million gallons a day there and near home. Don't go to the Sierra Nevadas for the present." It was then brought up to the city fathers, with a view to acquiring it, but a portion of the press of San Francisco defeated it, and called it the "cow pasture" scheme because there were some cows there. The first thing they knew—any city father who would have voted for the purchase of the "cow pasture" would have been severely criticised and would have lost prestige. After it was voted down, I said to our Board of Directors: "Now is your chance." They bought it—bought the whole thing—got rid of the "cows," and have kept on buying lands and water rights there ever since. Now the city and its representatives say that we bought it from under them; that they were anxious to get it; but that is not the case.

Pipe in Position, Ready for Being Paid Out Over Stern as Barge Is Moved Ahead.



Pipe Barge Arriving at West Shore of Bay, After Completing the Laying Across the Same From the East Shore.

That was in 1875. About two years after, in 1877, the city finally made up its mind that we controlled a pretty good situation, and appointed a committee, consisting of the mayor, the city attorney and auditor, to confer with the company, with a view to buying its properties. We got together. I advised our people not

PRESENT AND PROPOSED
WATER-SUPPLY
OF
SAN FRANCISCO

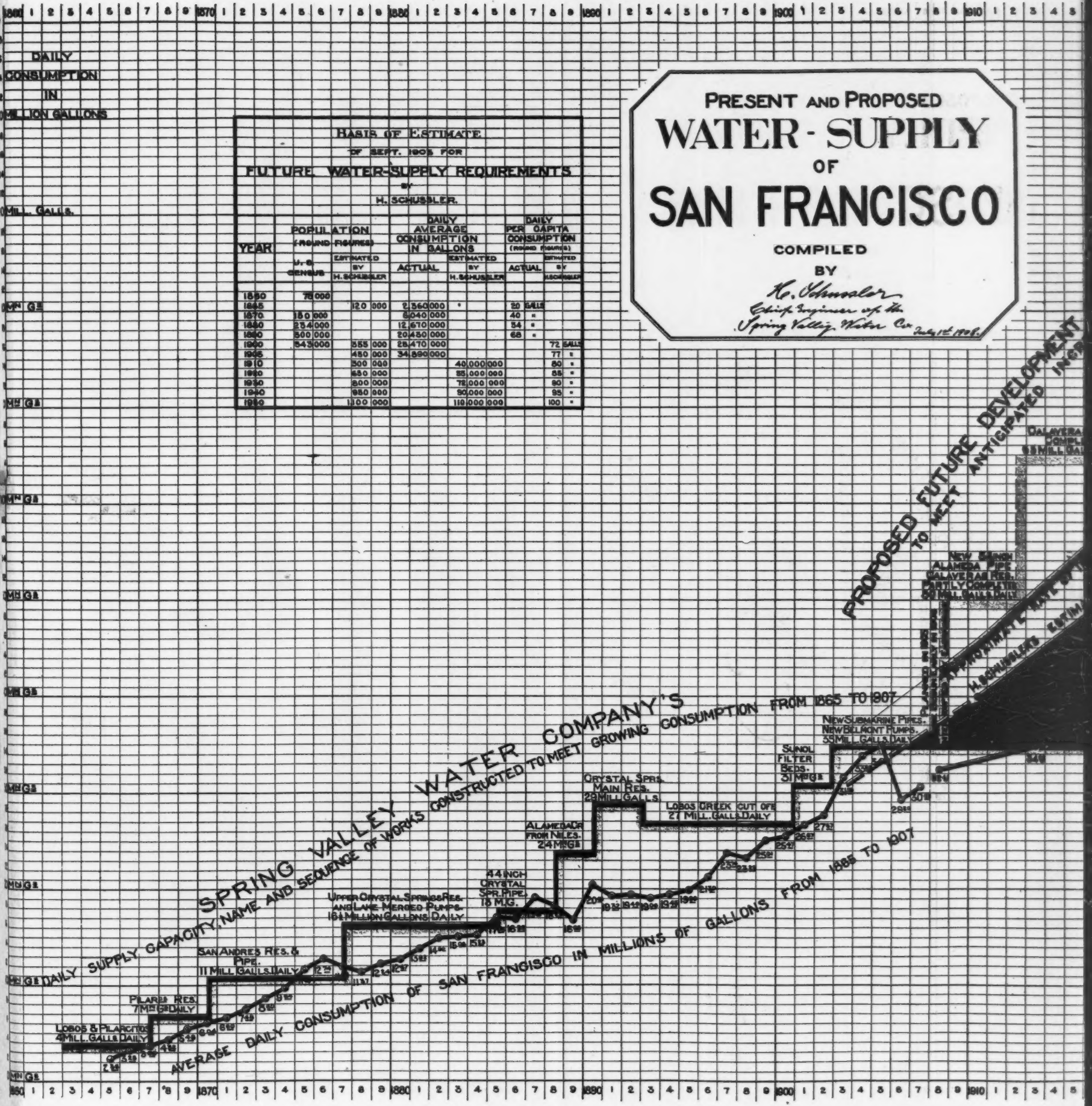
COMPILED
BY
H. Schussler
Chief Engineer of the
Spring Valley Water Co
July 1st 1908.

DAILY CONSUMPTION IN MILLION GALLONS

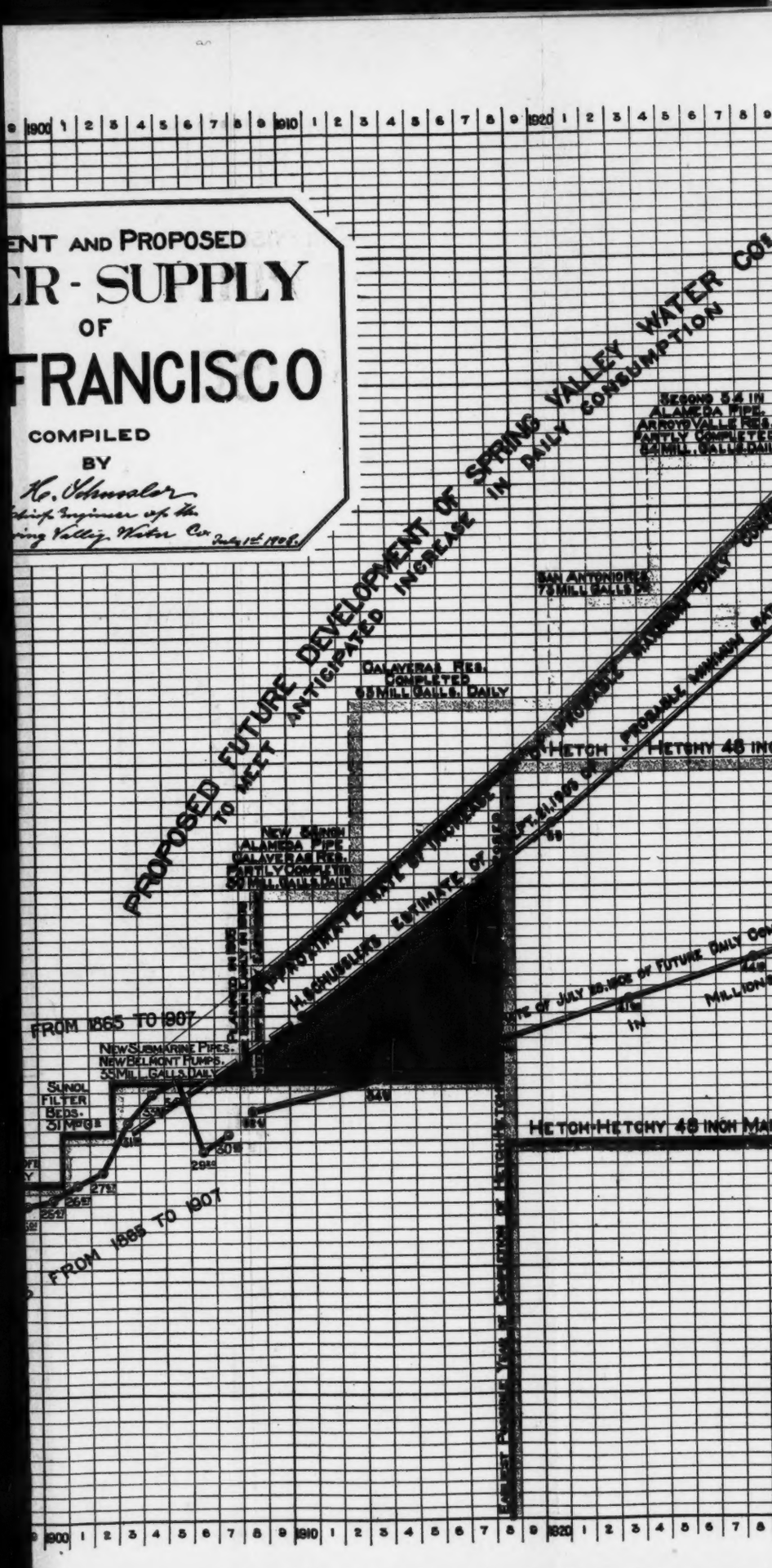
MILL. GALLS.

BASIS OF ESTIMATE
OF SEPT. 1903 FOR
FUTURE WATER-SUPPLY REQUIREMENTS
BY
H. SCHUSSLER.

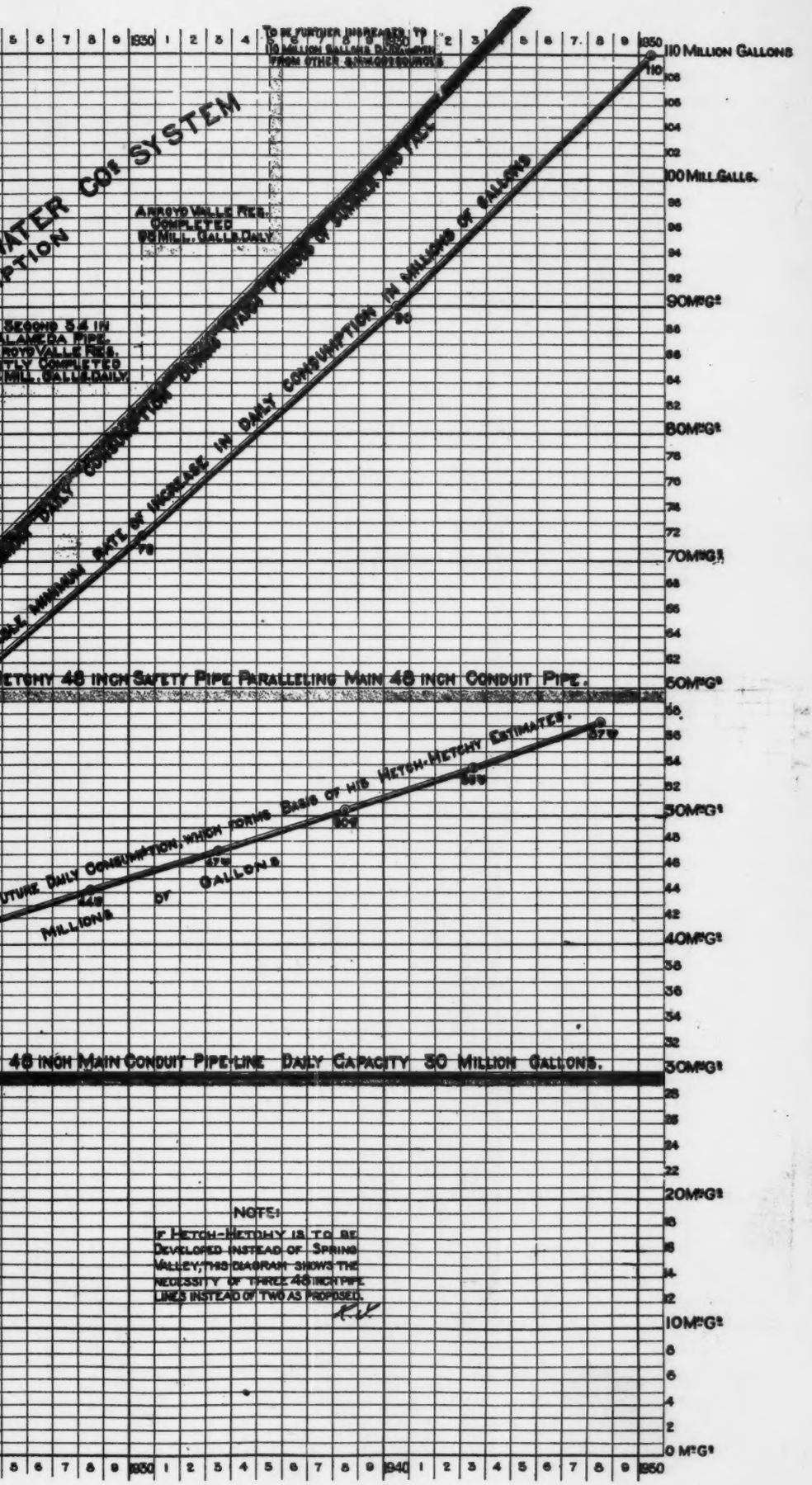
YEAR	POPULATION (ROUND FIGURES) U.S. CENSUS	POPULATION (ROUND FIGURES) ESTIMATED BY H. SCHUSSLER	DAILY AVERAGE CONSUMPTION IN GALLONS ACTUAL	DAILY AVERAGE CONSUMPTION IN GALLONS ESTIMATED BY H. SCHUSSLER	DAILY PER CAPITA CONSUMPTION (ROUND FIGURES) ACTUAL	DAILY PER CAPITA CONSUMPTION (ROUND FIGURES) ESTIMATED BY H. SCHUSSLER
1850	75 000				20 GALLS	
1865		120 000	2 360 000		20 "	
1870	150 000		6 040 000		40 "	
1880	234 000		12 670 000		54 "	
1890	500 000		20 450 000		68 "	
1900	543 000	555 000	28 470 000		72 GALLS	
1905		450 000	34 890 000		77 "	
1910		500 000		40 000 000	80 "	
1920		650 000		55 000 000	85 "	
1930		800 000		72 000 000	90 "	
1940		950 000		90 000 000	95 "	
1950		1100 000		110 000 000	100 "	


PROPOSED FUTURE DEVELOPMENT TO MEET ANTICIPATED INCR
CALAVERAS COMPLE 93 MILL GAL
NEW 54 INCH ALAMEDA PIPE CALAVERAS RES. PARTLY COMPLETE 93 MILL GALLS DAILY
H. SCHUSSLER'S ESTIMATE
SPRING VALLEY WATER COMPANY'S CONSTRUCTED TO MEET GROWING CONSUMPTION FROM 1865 TO 1907
NEW SUBMARINE PIPES. NEW BELMONT PUMPS. 55 MILL GALLS DAILY
SUNOL FILTER BEDS. 31 MILL GALLS
CRYSTAL SPRS. MAIN RES. 29 MILL GALLS
LOBOS CREEK CUT OFF 27 MILL. GALLS DAILY
ALAMEDA FROM NILES. 24 MILL GALLS
44 INCH CRYSTAL SPR. PIPE. 18 MILL.
UPPER CRYSTAL SPRINGS RES. AND LAKE MERGED PUMPS. 16½ MILLION GALLONS DAILY
SAN ANDRES RES. & PIPE. 11 MILL GALLS DAILY
PILARCITOS RES. 7 MILL GALLS DAILY
LOBOS & PILARCITOS 4 MILL. GALLS DAILY
DAILY SUPPLY, CAPACITY, NAME AND SEQUENCE OF WORKS
AVERAGE DAILY CONSUMPTION OF SAN FRANCISCO IN MILLIONS OF GALLONS FROM 1865 TO 1907

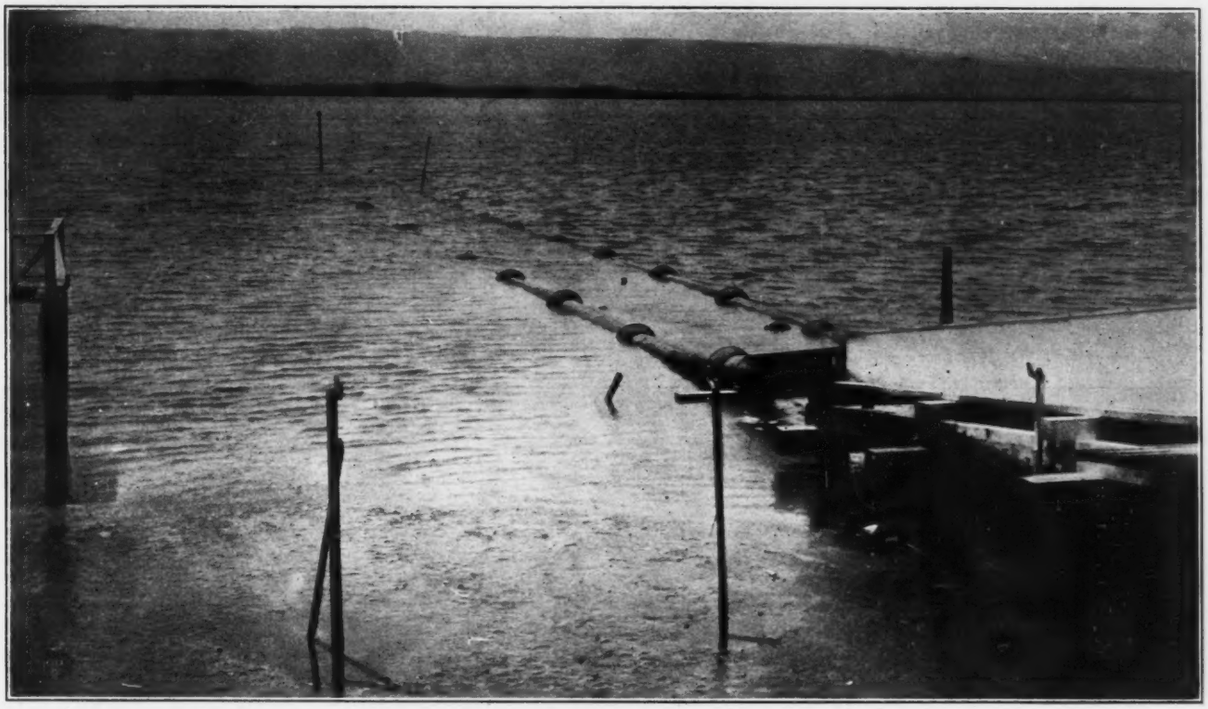
Black Triangle Shows Period of Constantly Increasing Shortage in the Water Supply, the only Remedy for which is the Immediate


ENT AND PROPOSED
ER - SUPPLY
OF
FRANCISCO
COMPILED
BY
H. Schussler
Chief Engineer of the
Spring Valley Water Co.
July 1st 1908.
PROPOSED FUTURE DEVELOPMENT OF SPRING VALLEY WATER CO
TO MEET ANTICIPATED INCREASE IN DAILY CONSUMPTION
CALAVERAS RES. COMPLETED 65 MILL. GALLS. DAILY
SECOND 54 IN. ALAMEDA PIPE. ARROYO VALLE RES. PARTLY COMPLETED 52 MILL. GALLS. DAILY
SAN ANTONIO RES. 73 MILL. GALLS. DA
HETCH HETCHY 48 IN
NEW 54 INCH ALAMEDA PIPE. CALAVERAS RES. PARTLY COMPLETED 90 MILL. GALLS. DAILY
H. SCHUSSLER'S ESTIMATE OF
FROM 1865 TO 1907
NEW SUBMARINE PIPES. NEW BELMONT PUMPS. 35 MILL. GALLS. DAILY
SUNOL FILTER BEDS. 31 MILL. GALLS.
HETCH HETCHY 48 INCH MAIN
FROM 1885 TO 1907
1900 1 2 3 4 5 6 7 8 9 1910 1 2 3 4 5 6 7 8 9 1920 1 2 3 4 5 6 7 8

Supply, the only Remedy for which is the Immediate and Continued Development of the Spri



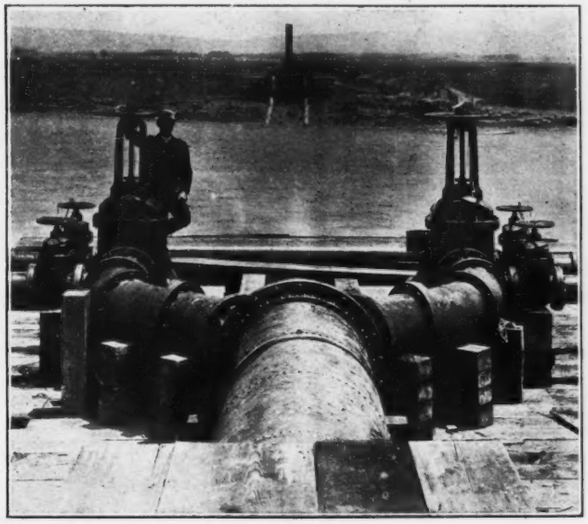
t of the Spring Valley Water Company's System.



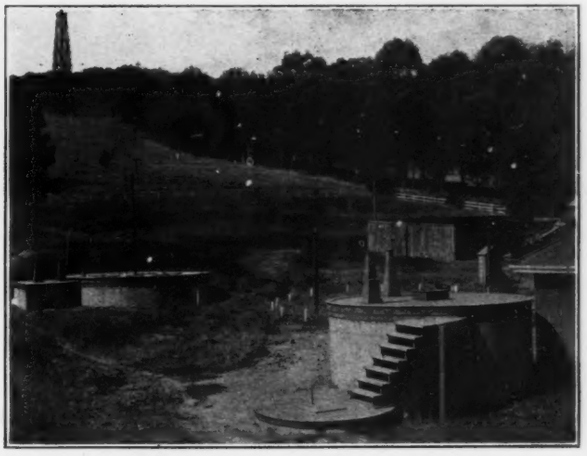
Submarine Pipes Connected With the West Shore of San Francisco Bay.

to put the price too high. So they asked $16,000,000 for the property, which was about equal to the stock at that time issued and the bonds; but as the stock was selling then at about $60 a share, and par was $100, the people thought that $16,000,000 was too high, and so the city offered the company $11,000,000, but they did not want the Calaveras "cow pasture." So we said: "Very well, we will keep the Calaveras property," and so, for the peninsular situation, on the west side of the bay, the city offered $11,000,000 in city bonds. After some discussions our people gradually came down from $16,000,000 to $13,500,000. In the various discussions it was suggested that if the city would come up a little, we might come down some. I think there could have been a sale made at $12,500,000, including the Calaveras, but they would not have Calaveras, nor would they raise their offer, and so the sale fell through.

In the year 1880 we had spent enough to bring the total up to $13,245,000. In 1890 the total amounted to $21,389,000, inclusive of the $12,000,000. In 1900 it was $28,135,000, which always included the $12,000,000, and which does not make any allowance for the increased value of the properties as we bought and united them. If we bought a ranch which was worth only a certain amount of money for farming purposes—we practically bought all these properties at farming prices—but when we united a lot of these properties—for instance, in the Alameda Creek properties, after we had put together a number of those watershed and reservoir properties into one unit for the particular purpose of gathering and retaining the water, it was worth



Submarine Pipes Crossing Navigable Slough Near Dumbarton Point.



Alameda Creek Water Arrives at Belmont Pumping Station and Is Forced Into the Standpipe.

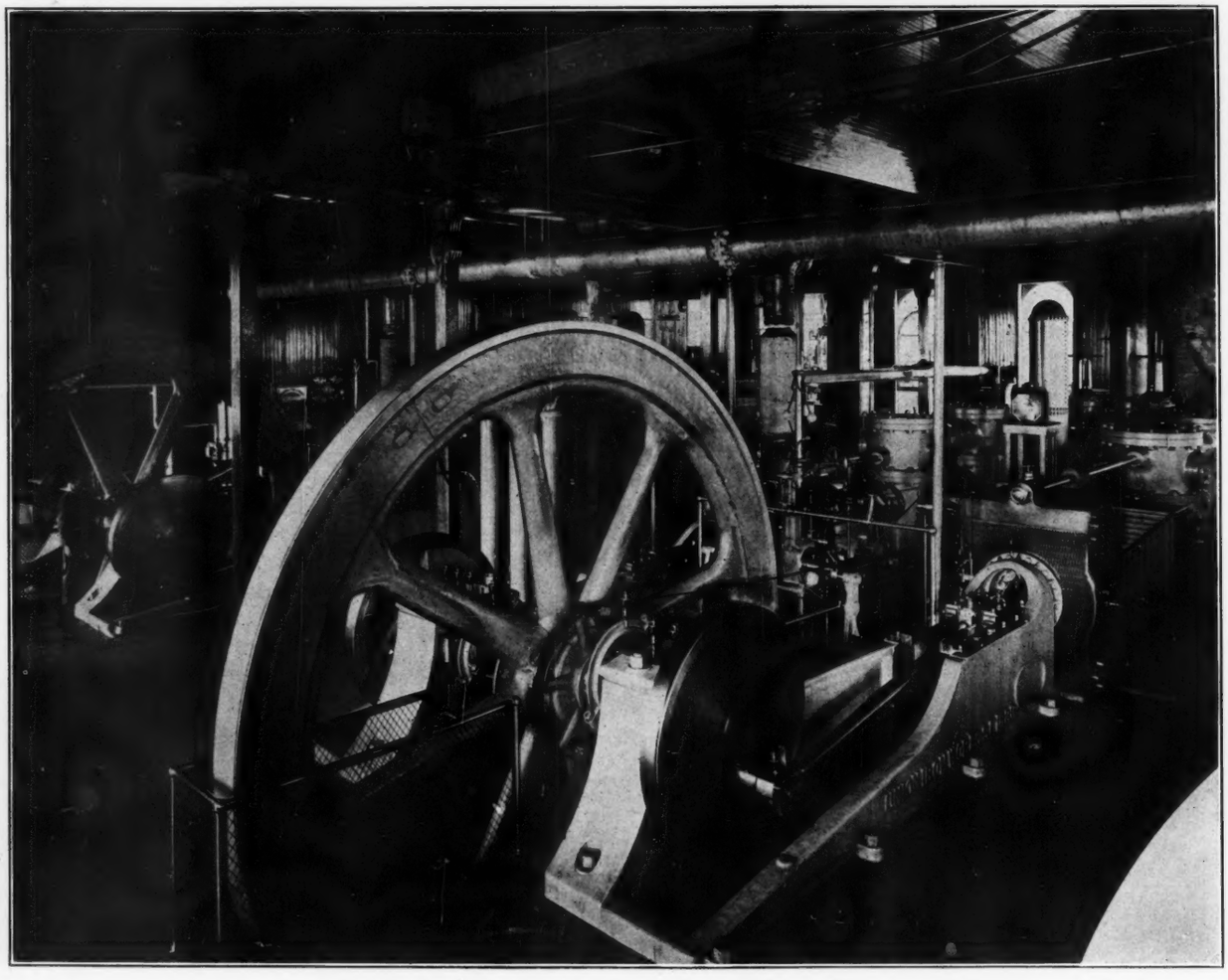
a good deal more than the separate farming values of each little separate farm. Now that increase of value is not put into this table. This is simply the cash paid for properties and for works constructed, including the various dams, reservoirs, tunnels, pipes, filter beds and so on—so that at the present time, at the end of the year 1908, it represents a total of $32,850,000, which includes again the original $12,000,000 from the year 1877.

In order to give you some idea of how the properties have increased in value, I will call your attention to our tax bills. In the year 1885 we were taxed in round figures a little over $56,000; in 1895, $102,000; in 1900, $226,000; that is the money we paid annually for taxes. In 1905, that is the year before the earthquake, $370,000, or over $1,000 a day paid for taxes. Then came the earthquake, which reduced the total tax paid by the company, so that we paid about $280,000 in 1906; $315,000 in 1907, and $320,000 in 1908.

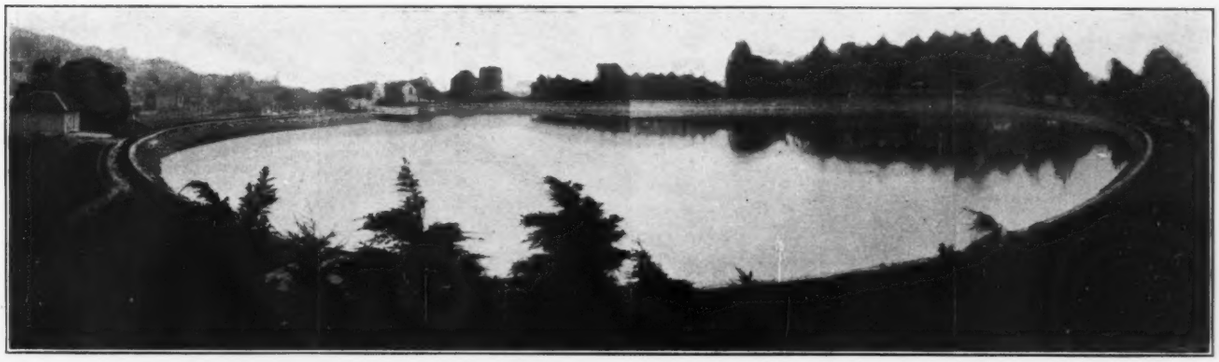
In 1877 (the year in which the city's offer of $11,000,000 was made exclusive of Calaveras, etc.) San Francisco consumed 11,940,000 gallons per day; in 1885, 17,050,000 gallons per day. In 1895 it had risen to 19,900,000 gallons; in 1900 to 25,470,000 gallons, and in 1905 to 34,890,000—which shows not only the rapid increase in the population, but also a corresponding increase in the per capita consumption. When we first started, in 1865, the use per capita was about 20 gallons a day, and it has gradually risen to a little over 80 gallons per head—that is, man, woman and child.

The law in 1858, under which our company was organized, terminated in 1880, when the new constitution took its place—the latter followed in this city by the new charter in 1900.

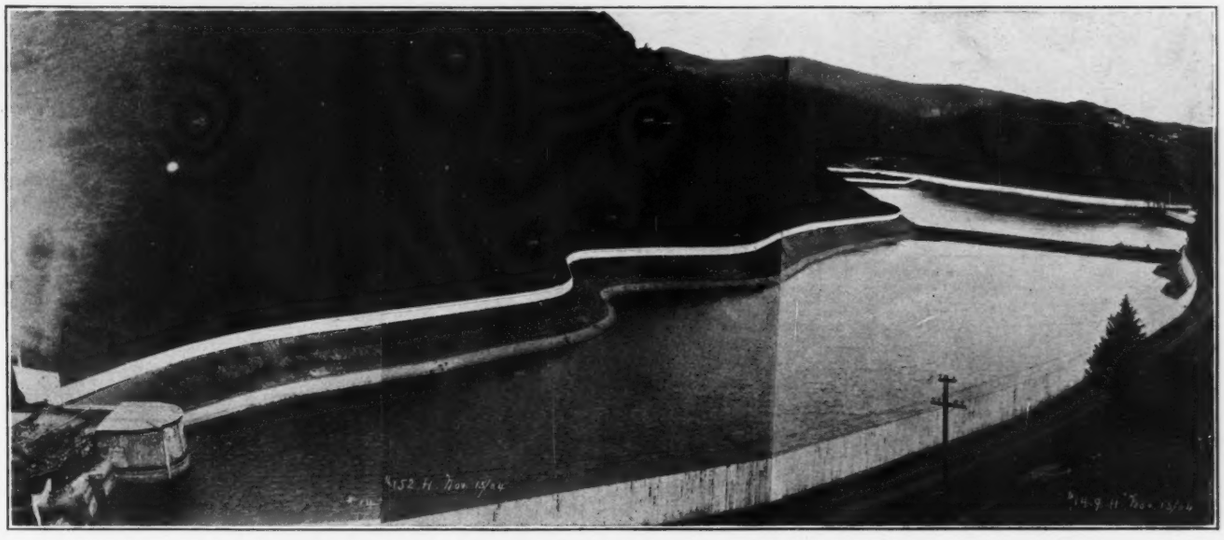
For the purposes of schools, public buildings, street flushing and sewer flushing and for the use of water from hydrants, etc., the city's annual payments varied, from 1883 to 1894, from a minimum of about $43,000 to a maximum of about $103,000 a year. Then, in 1895, a great fire occurred south of Market street, and the city asked us to still further extend our larger fire pipe system. The company's answer was: "Our pipes are large enough to supply our customers—that is, the private customers, who furnish fully 90 per cent of our revenue. If you want us to increase the size of our pipes, and thereby give you a fire service at the same time, and if you will contribute towards it by giving us a better rate for hydrants, we will put in larger pipes for fire purposes." So it was understood that the city would fix the rates for hydrants at



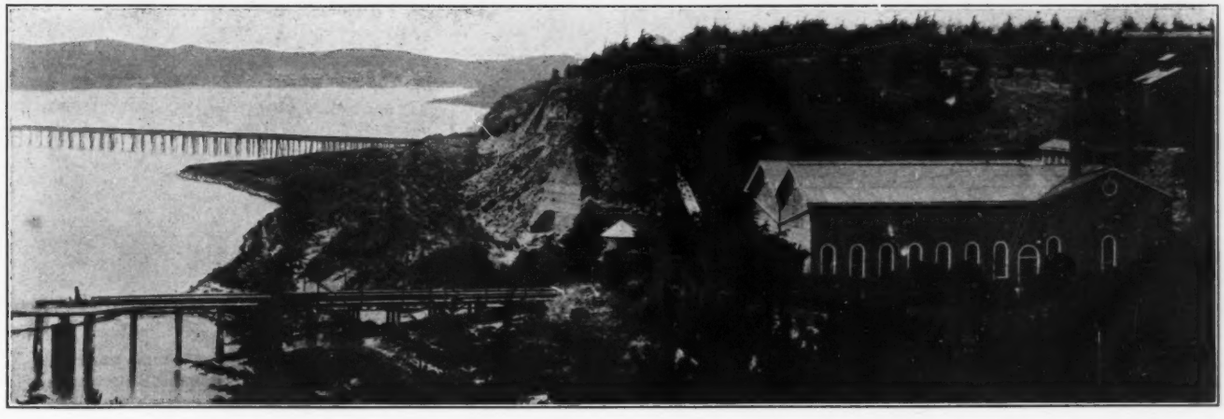
Interior View of Part of Belmont Pumping Station.



College Hill Distributing Reservoir in the South Mission, at About 250 Feet Elevation.



Lake Honda Reservoir, South of Golden Gate Park, at About 365 Feet Elevation

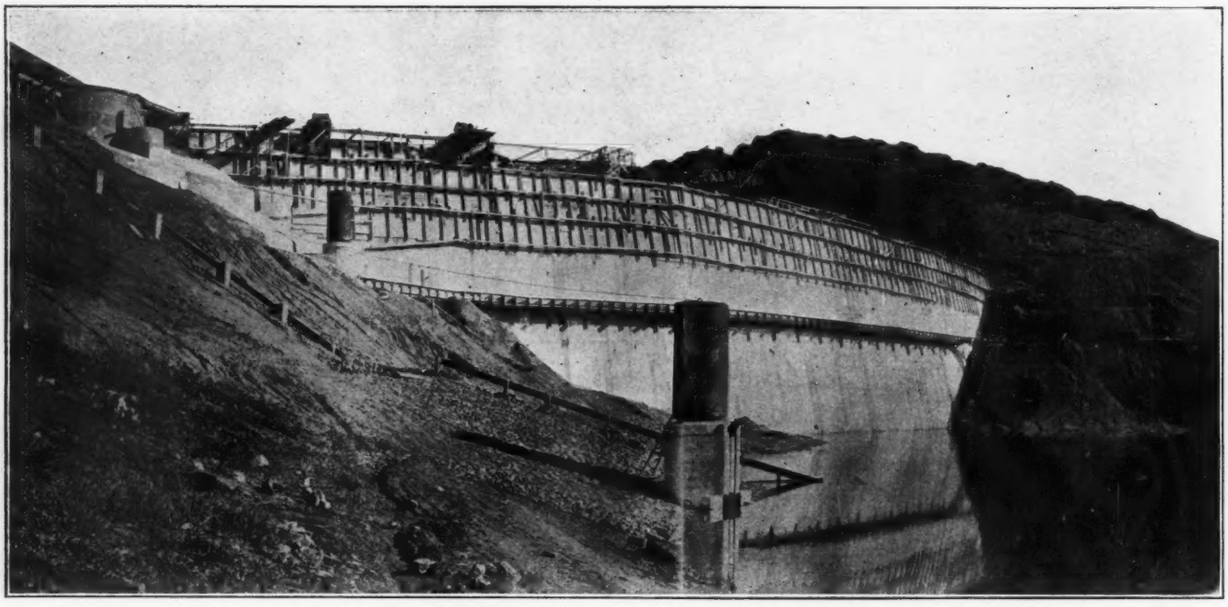


Lake Merced Reservoir and Emergency Pumping Plant in the Southwestern Portion of San Francisco County.

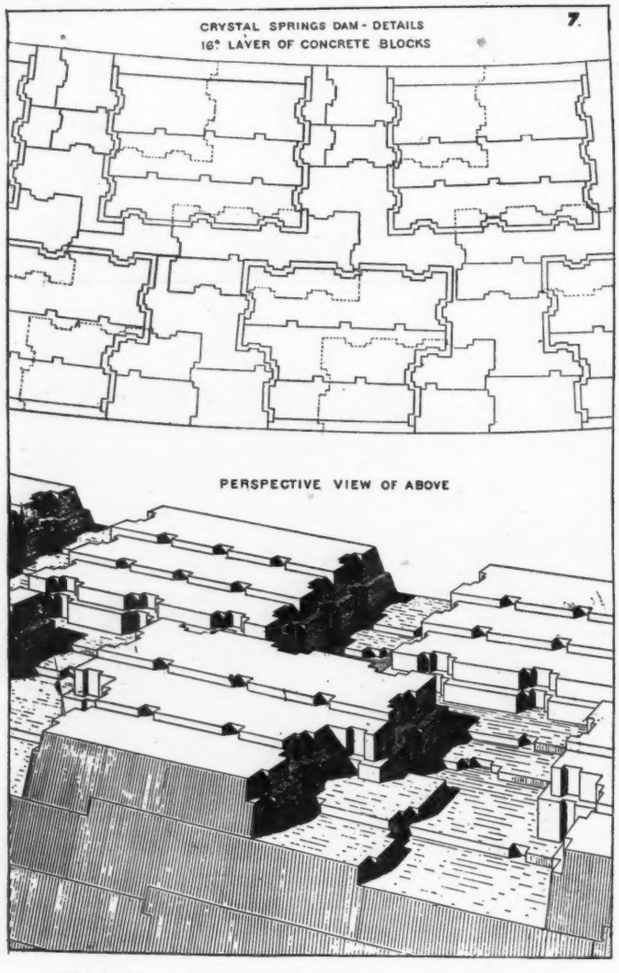
$5 instead of the former $2.50 a month. Our company went to work at once and spent in a few years very large sums of money in increasing the size of the pipes. In most instances we paralleled our domestic supply pipes—thus frequently having a six or eight-inch pipe on one side of the street, ample for domestic purposes, while we now laid a 12-inch or 16-inch pipe, or over, on the other side.

This fire pipe extension by the company was made with the distinct understanding that the $5 rate per hydrant would be permanent, and it went on extending the big pipe system over large sections of the city; thus the contribution that the city paid for all municipal purposes rose gradually to about $245,000 in 1898, which encouraged the company to go on extending the enlargement of the pipe system. Then came what Frenchmen call the dèbâcle. It came with the new regime which was inaugurated with the new charter. They simply paid whatever they felt like paying, which payments, as will be hereafter shown, marked a rapid decline after the year 1900.

The company had meanwhile spent about $2,000,000



Crystal Springs Concrete Dam in Course of Construction.



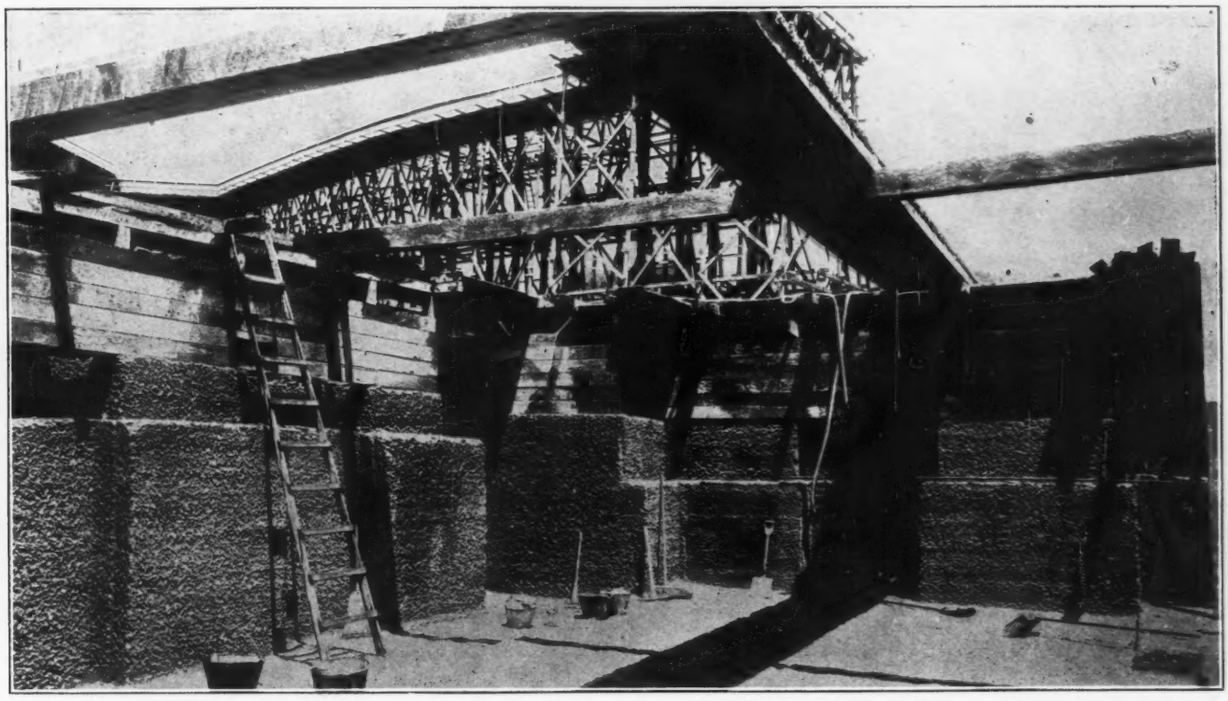
Ideal Plan of Interlocking Block System Used in Construction of Crystal Springs Dam. Each Block Averages 40 Feet in Length, 30 Feet in Width and From 7 to 9 Feet in Height, Blocks Being Built in Place Alternately.

in increasing its pipe system, for which extra investment it was paying interest. But the parties in control of the city government, under the new charter, cut the city's contribution for water from about $226,000 in 1900 to $161,000 in 1902, $93,000 in 1904, $65,000 in 1906. The company, with the decreasing payments from the city, was compelled to decrease its extension of larger mains for fire purposes. Then, in 1906, came the earthquake and fire.

Such was the action of the supervisors in providing revenue for the dual purpose of increasing our distributing pipe system, to answer both purposes; namely, domestic and fire supply.

Prior to the charter we had bought a large property of 42 acres back of the branch jail 2 and 3, at 310 feet elevation above tide, and we offered to build there at once a 500,000,000-gallon reservoir if the city would keep on with its hydrant contribution and not disturb the water rate. But as one board could not pledge the succeeding board, and the board that was in office would do nothing for us but reduce the water rate, we had to live from hand to mouth and practically stop all new work.

Our company owned a seven-acre piece of property at the head of Market street, where our predecessors had built a 2,000,000-gallon reservoir, and a number of years prior to the disaster we proposed to build a sixteen to twentymillion-gallon reservoir there on an elevated rocky knoll, from which large reservoir a large independent fire main, studded with hydrants, was to be laid along Market street, to and through the business center of the city, and to be used for fire purposes only. We told the supervisors that if that reservoir was built at the head of Market street, at a 150-feet elevation, with a good large fire pipe down Market street, with many hydrants, that it would be difficult for any fire ever to cross Market street from one side to the other. They answered us by ordering Ridley street cut through the middle of the hill, thus not only destroying the old reservoir on the hill, but they also put a quietus on our plan for building a large fire protection reservoir there in the heart of the city. And, furthermore, we had to pay an assessment of



Manner in Which Blocks Were Prepared to Be Filled With Concrete—Rammed Into Place in Thin Layers, and New Block Being Surrounded by Four Large Blocks Previously Built With Niches in Them, Thus Making the New Block Interlock Into All the Four Surrounding Blocks.

over $60,000 for cutting the street through and thus destroying our unique reservoir property.

In 1901 (in which year, including the $12,000,000 of original value in 1877, the total expenditures for betterments were over $29,000,000) the city engineer, appointed under the charter, valued all of the company's works and properties at $24,667,000. During this year we expended a million dollars for betterments, and, as a consequence, he reduced the value in 1902 to $24,466,000. During 1902 we spent for betterments about $700,000, and, probably thinking he had not treated us right the year before, he increased the valuation in 1903 to $28,024,000.

Then came another set of supervisors, and they employed another so-called expert, and although we had spent about $500,000 for betterments during 1903, he cut our value from $28,024,000 in 1903 down to $24,673,000 in 1904, which brought us back again to the city's valuation of the year 1901, although we had expended in the meantime for betterments about $2,200,000.

The following year, 1905, he raised the value to about $25,000,000, although we had expended about $540,000. From 1905 to 1909 we expended for betterments about $1,000,000, and, as a consequence, the city engineer reduced our valuation from $25,000,000 in 1905 to $24,404,000 in 1909.

In other words, under the operation of the new charter, while the company expended about $4,000,000 for betterments in works and necessary properties—during the period from 1901 to 1905, during which time the increasing value of the properties and works being also shown by the increase in the company's taxes paid, from about $203,000 in 1901 to $320,000 in 1908—still, in spite of these expenditures for betterments of about $4,000,000, and in spite of the tax bills showing in the seven years an increase in value of over 50 per cent—the city engineer, under the eyes of the supervisors, rduced the valuation of the company's properties and works from $24,667,000 in 1901 to $24,404,000 in 1909.

Crystal Springs Dam From Below, Showing Winter Overflow.

But, to cap the climax, the supervisors in 1901 arbitrarily cut the city engineer's low valuation of $24,667,000 down to $22,940,000, and the city engineer's valuation in 1902 of $24,466,000 down to $23,914,000.

The supervisors that followed cut their city engineer's valuation in 1903 of $28,024,000 down to $24,124,000; and in 1904 cut their city engineer's low valuation of $24,673,000 down to $23,121,000. And on these low

valuations, arbitrarily fixed by men that were either inexperienced or prejudiced, formed the basis upon which they fixed the water rates.

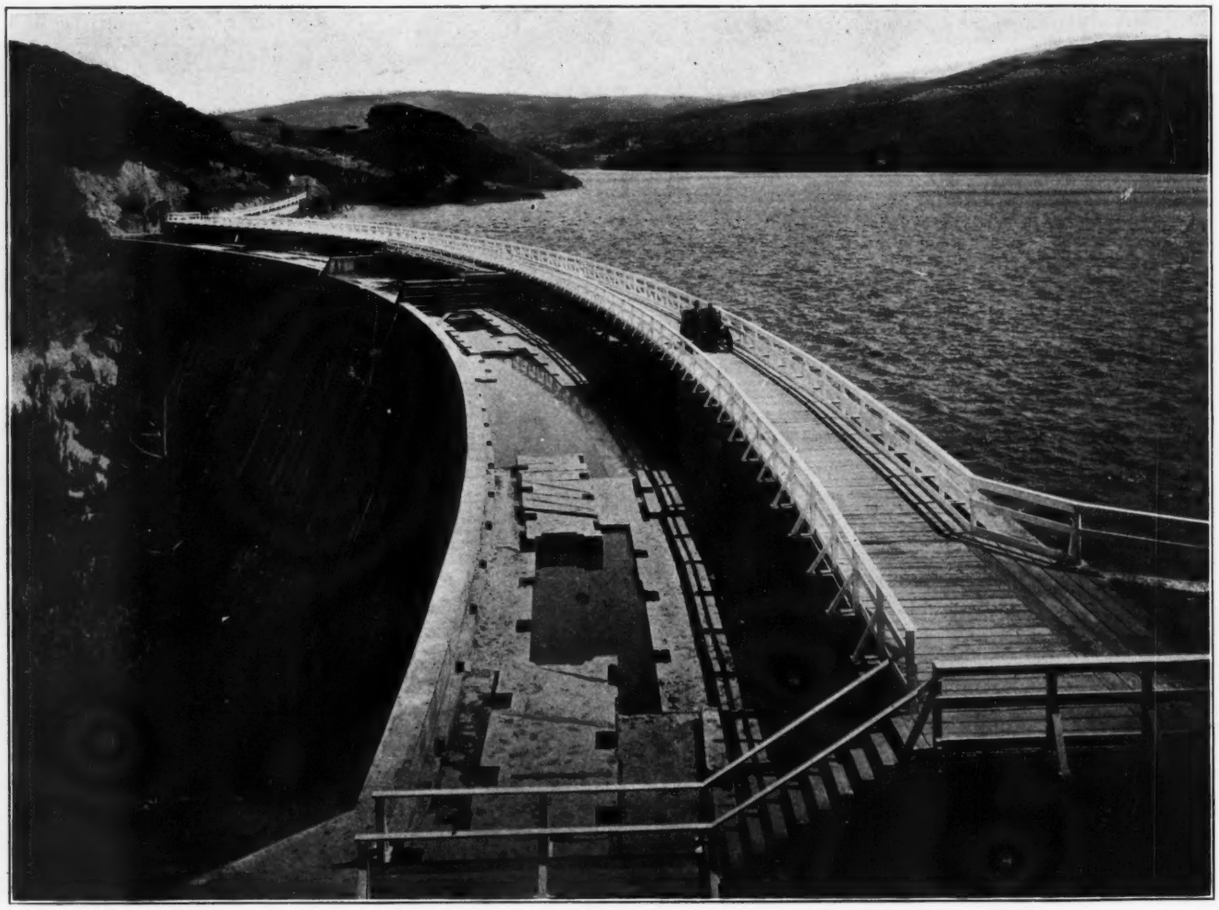
In this manner the foundation was laid for the present chaos in the water situation, and it can be easily understood that no sane man or corporation, under these circumstances, was willing to invest more money for betterments in an enterprise that, although vital to the city's existence and growth, was so unjustly and unfairly treated and interpreted by the city authorities.

As heretofore stated, the daily supply capacity of the works, as so far developed, is 35,000,000 gallons a day, and the daily consumption has nearly reached this figure now for the second time.

By constructing, as proposed, the successive reservoirs on the Alameda Creek system; the Calaveras, which is to hold about 30,000,000,000 gallons; the San Antonio, with about 8,000,000,000; and in the next valley, the Arroyo Valley reservoir, which is proposed to hold about 12,000,000,000 gallons—we will have a total storage capacity of about 50,000,000,000 gallons on the Alameda system.

The plan was to gradually build those reservoirs, one after the other, always keeping ahead, of what I considered from my past experience, likely to be the ratio of increase of daily consumption. According to the program of 1903, we proposed to be ready to supply, in 1910, 40,000,000 gallons a day; in 1920, 55,000,000 gallons a day; in 1930, 72,000,000 gallons a day; in 1940, 99,000,000 gallons a day, and in 1950, 110,000,000 gallons a day, all from the company's properties. In case of future increase of consumption, beyond 1950, we would develop other properties of the company.

The warm weather daily supply sometimes, for a period of 10 to 15 days in succession, jumps from 15 to 20 per cent above the annual average daily supply. Our works have heretofore been so constructed, not only in storage capacity, but also in conveying capacity, so as to meet such ordinary emergency drafts. We proposed to continue to meet that, and all our future plans are based, not only on having ample conveying capacity, but also by having adequate storage capacity in the city to meet the greatest possible draft that might come during the hot spell.



Crystal Springs Dam in Its Present Condition, Seen From the North.

The map representing the proposed Hetch-Hetchy scheme is a copy of the diagram that I furnished to the United States Circuit Court in 1904—and I showed that if at that time the city would commence and would diligently prosecute the work, like an experienced and well-governed private corporation, they might possibly be able in six or seven years to complete the Hetch-Hetchy system; but that by two pipe lines of 30,000,000 gallons capacity each, by the time that they could possibly have the works completed from Hetch-Hetchy to San Francisco, they would be able to a little more than meet the daily consumption at that time.

If the city takes the supply field away from this

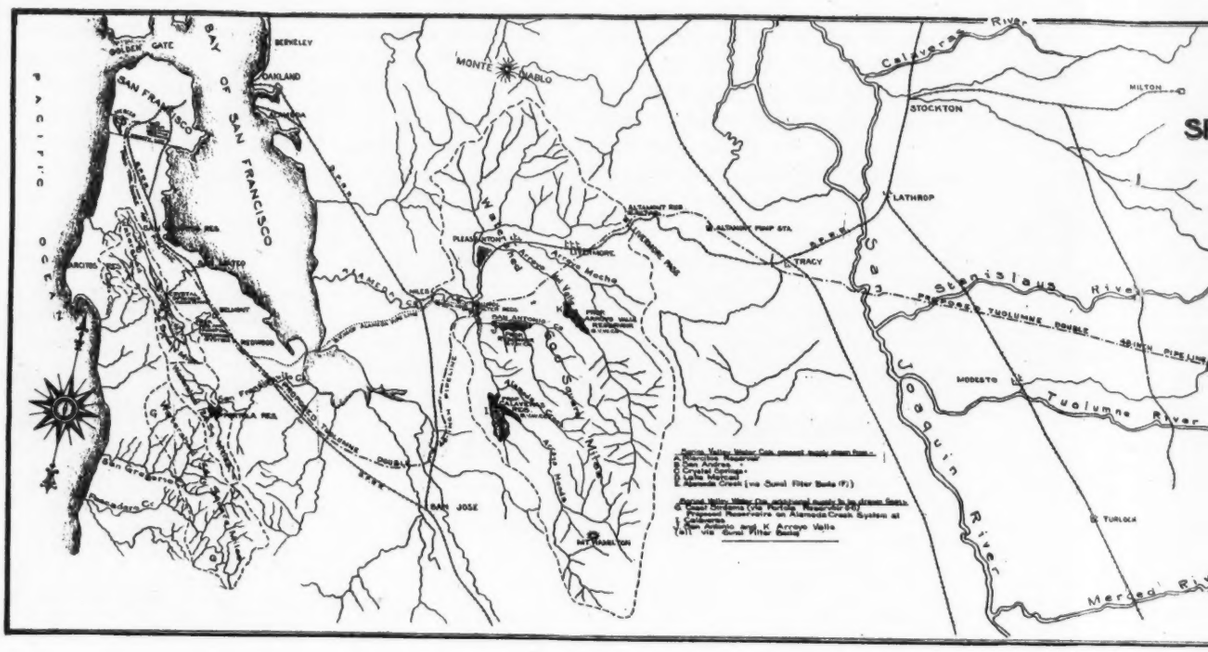
company—this company is, naturally, going to stay in the business. They will go to San Mateo county; there is a great sale for water there; and Alameda county—and all the way down to Alameda, Oakland and Berkeley, where there is a great field for the sale of water; therefore the city of San Francisco, if its Sierra scheme carries, will have to take care of the supply of the city over and above the supply it now receives. Of course we would not leave the city entirely until the Hetch-Hetchy water comes in, which, at best, is many years hence; but until then nobody could expect the company to expend many millions of dollars in order to increase its supply meanwhile. We now have a daily development of 35,000,000 gallons a day, and, in all likelihood, it would have to stay there. It is very difficult and would be unwise to raise any money, with the city's threat hanging over us of bringing in an independent supply that will undersell the present company, as they say they think they can. Capital, as you know, is very conservative. A million dollars is one of the biggest cowards on earth—except two millions. The maximum present development of the company is 35,000,000 gallons a day. The earliest possible time will be about ten years hence, with an honest administration and all legal troubles settled, when the city could have its Tuolumne works complete, either from Lake Eleanor or Hetch-Hetchy, or both.

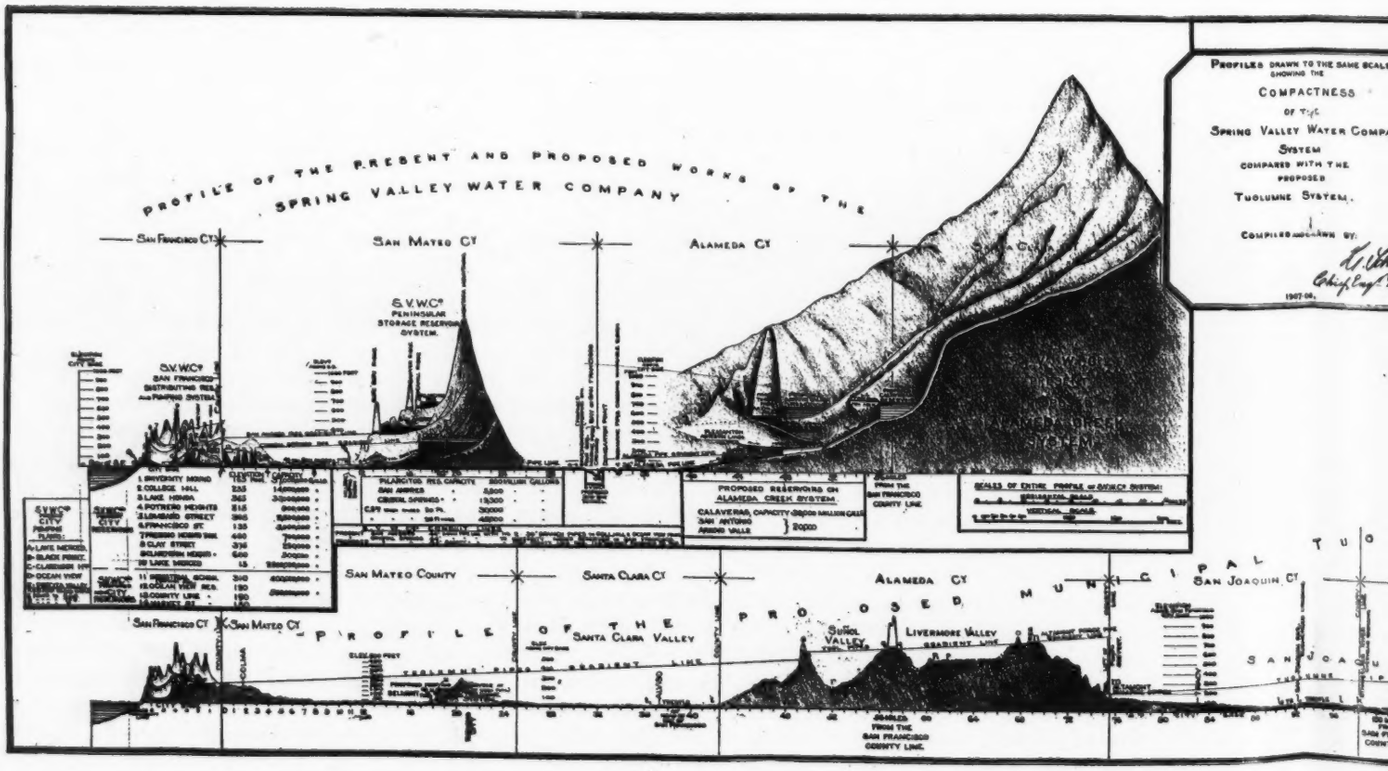
As you know, the Hetch-Hetchy scheme is very popular now. I should not wonder that, if it were put to a vote of the people now, they would vote for it and carry it. Now, supposing for argument's sake, that that is the case; that they carry it. That means that in the proposed Sierra works they will build two pipe lines. The two pipe lines contain a weight of about 270,000,000 pounds of plate-iron. Say about from one-twentieth to one-twenty-fifth part of that weight, in addition, would be rivets; that would mean, say 10,000,000 pounds of rivets. Have you ever figured how many mills in the East and Scotland and Great Britain that would occupy in rolling these plates, and for how long? Suppose you could get them today and start in with them at once and manufacture and lay your two pipe lines. These two pipe lines have not been accurately surveyed or definitely located by experienced people. In order to be able to furnish a low cost estimate, they say: "We will lay them mostly on the county road." Well, the county road in a number of instances is very crooked, on a steep side hill, and is often very narrow, and, in several instances, passes through alkali country, which rapidly destroys the pipe. The road grade is often only 16 feet wide. To lay two pipes, each one 48 inches in diameter, and carrying a great pressure, close together on a narrow road, in case a break occurs in one pipe, it is apt to blow out the other one. The consequence is that they must buy two rights-of-way, far enough apart from each other so that the rupture of one of the pipes does not also destroy the other. But, granted for argument's sake, that they could build it on their proposed route (the experts they have, I think, believe they can build it), I want to show you the strange feature of their plan which I made it a point to show to the court. They have taken the ratio of increase of daily consumption—not what our actual experience has shown has been from 1900 to 1905, and is going to be the ratio—but what it was away back in the olden times, which allows, in 1948, a little over 57,000,000 gallons a day; where the Spring Valley Water Company's program is providing in that year for a daily consumption of 100,000,000 gallons. The consequence is that, basing your estimates on an inadequate supply all along, you will find that your estimate of cost is also very much too low, if you take into consideration that the population and water consumption is going to increase very much faster from this year forward than it did during the 35 years from 1865 to 1900; so that my prediction, made in the United States Circuit Court five years ago, was that at the same time that you do start laying the two 48-inch pipes, from

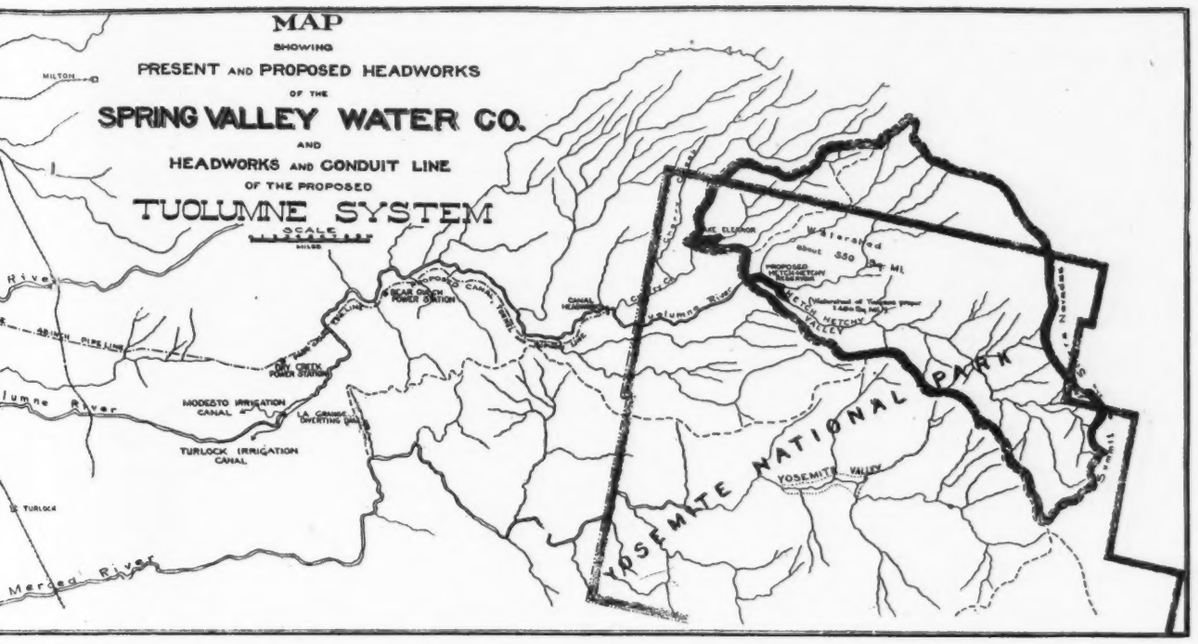
Getting Ready to Put on Manholes on Main Wrought Iron Conduit Pipes Leading From the Alameda and the Peninsular Systems to the San Francisco Distributing Reservoirs. This Work Marks the Last Phase of Construction of These Pipes, Before Water Is Turned On.

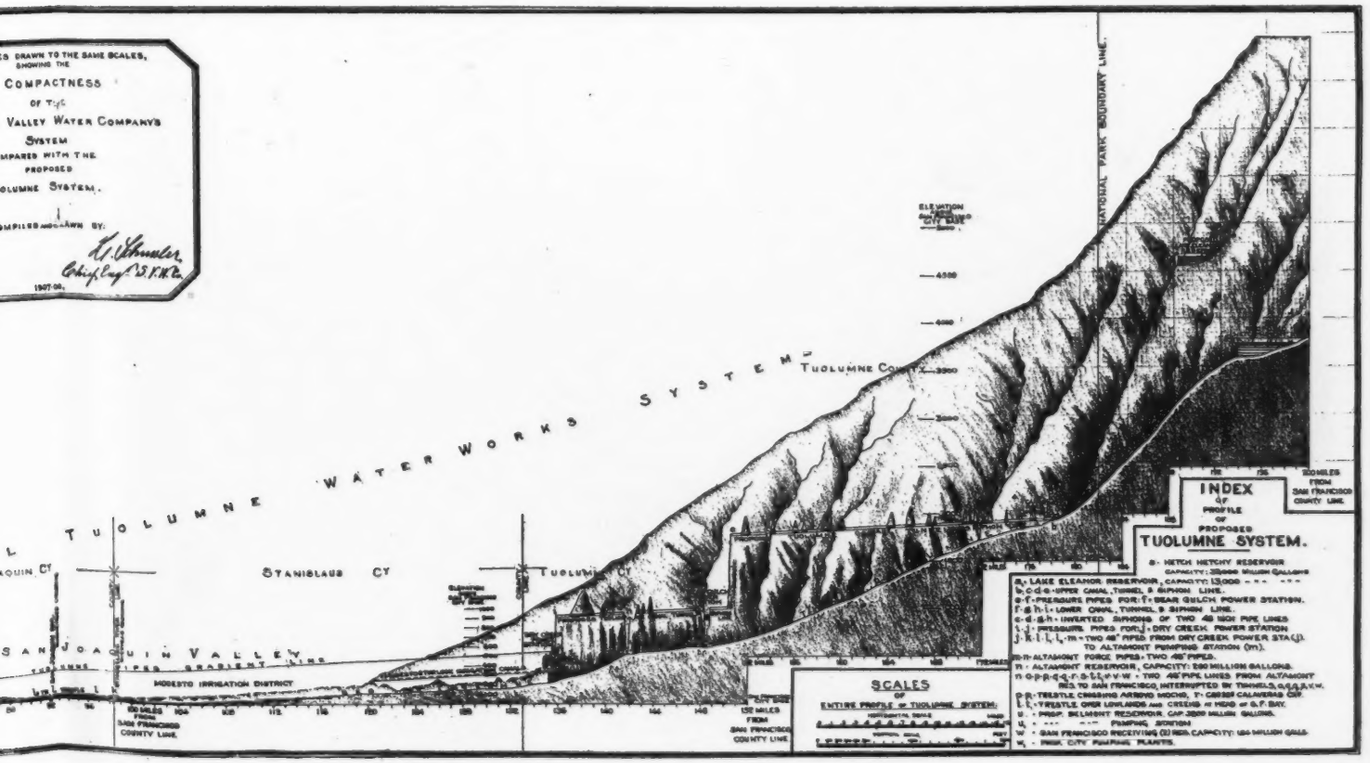
the Hetch-Hetchy ditch into town, you have to also start the third pipe line; because the moment you have the first two lines finished, the daily consumption will be practically up to their maximum capacity, and then you have no safety factor left in form of a parallel safety pipe to come into town with the other two supply lines, to act in case of rupture; and, furthermore, your daily consumption immediately runs away with you again, and, as it takes a number of years to lay the third pipe, you are behind again. The third pipe should therefore be finished at the same time with the two first ones.

Now that is the situation. The trouble is a great many people think that it is the Spring Valley which is up against it, but from what I know of the owners of the Spring Valley, they don't think so; in fact, they know they are not. They think and know that they have a very fine property, and if the city, with the majority of its citizens or voters, decides that they will go on with the Tuolumne work, and not acquire the Spring Valley, naturally this company will have to look for another market for its water. They must have a revenue, as they must pay the interest on their bonds


PACIFIC OCEAN
BAY OF SAN FRANCISCO
GOLDEN GATE
BERKELEY
OAKLAND
SAN FRANCISCO
MONTE DIABLO
Calaveras River
MILTON
STOCKTON
LATHROP
TRACY
Stanislaus River
Tuolumne River
MODESTO
TURLOCK
San Joaquin River
SAN JOSE
MT. HAMILTON
Alameda Creek
Arroyo Mocho
Arroyo Valle
Pleasanton
Livermore
Sunol
Niles
Irvington
Centerville
Mission
Crystal Springs
Lake Merced
Alameda Creek (via Sunol Filter Beds ?)
San Antonio and K Arroyo Valle
Tail via Sunol Filter Beds


PROFILE OF THE PRESENT AND PROPOSED WORKS OF THE SPRING VALLEY WATER COMPANY
San Francisco Cty
San Mateo Cty
Alameda Cty
S.V.W.Co's PENINSULAR STORAGE RESERVOIR SYSTEM.
S.V.W.Co's SAN FRANCISCO DISTRIBUTING RESERVOIRS AND PUMPING SYSTEM.
PILARCITOS RES. CAPACITY 350 MILLION GALLONS
CRYSTAL SPRINGS 2,500
CRYSTAL SPRINGS 13,500
30000
40000
PROPOSED RESERVOIRS ON ALAMEDA CREEK SYSTEM
CALAVERAS, CAPACITY 2500 MILLION GALLONS
SAN ANTONIO
ARROYO VALLE
2000
FROM THE SAN FRANCISCO COUNTY LINE.
SCALES OF ENTIRE PROFILE OF S.V.W.Co's SYSTEM:
HORIZONTAL SCALE.
VERTICAL SCALE.
PROFILES DRAWN TO THE SAME SCALE SHOWING THE
COMPACTNESS
OF THE
SPRING VALLEY WATER COMPANY'S
SYSTEM
COMPARED WITH THE
PROPOSED
TUOLUMNE SYSTEM.
COMPILED AND DRAWN BY:
1907-08.
San Mateo County
Santa Clara Cty
Alameda Cty
San Joaquin Cty
PROFILE OF THE SANTA CLARA VALLEY
PROPOSED MUNICIPAL TUOLUMNE
SUNOL VALLEY
LIVERMORE VALLEY
GRADIENT LINE
TUOLUMNE RIVER
SAN JOAQUIN
FROM THE SAN FRANCISCO COUNTY LINE.


MAP
SHOWING
PRESENT AND PROPOSED HEADWORKS
OF THE
SPRING VALLEY WATER CO.
AND
HEADWORKS AND CONDUIT LINE
OF THE PROPOSED
TUOLUMNE SYSTEM
SCALE
MILES
MILTON
Tuolumne River
Merced River
TURLOCK
TURLOCK IRRIGATION CANAL
MODESTO IRRIGATION CANAL
LA GRANGE DIVERTING DAM
DRY CREEK POWER STATION
BEAR GULCH POWER STATION
PROPOSED CANAL TUNNEL
PROPOSED HETCH HETCHY RESERVOIR
CANAL HEADWORKS
LAKE ELEANOR
Watershed about 350 Sq. Mi.
HETCH HETCHY VALLEY
YOSEMITE VALLEY
YOSEMITE NATIONAL PARK


COMPACTNESS
OF THE
VALLEY WATER COMPANYS
SYSTEM
COMPARED WITH THE
PROPOSED
TUOLUMNE SYSTEM.
COMPILED AND DRAWN BY:
Chief Engr. S.F.W.Co.
1907-08.
TUOLUMNE WATER WORKS SYSTEM
TUOLUMNE CO
STANISLAUS CO
SAN JOAQUIN VALLEY
MODESTO IRRIGATION DISTRICT
NATIONAL PARK BOUNDARY LINE
INDEX
OF
PROFILE
OF
PROPOSED
TUOLUMNE SYSTEM.
SCALES
OF
ENTIRE PROFILE OF TUOLUMNE SYSTEM.

and to their stockholders, and provide for taxes and operating expenses.

The map shows the company's physical situation. It shows the city with its various reservoirs and pipe lines; the watersheds, containing on the peninsula about 36 square miles here—Pilarcitos, San Andres and Crystal Springs reservoirs, and also the location of the water rights they control on the coast streams. The latter are not yet quite complete. Their water will eventually be handled through a tunnel from Pescadero Creek into San Gregorio Creek, and from there into Portola reservoir, and from there into Crystal Springs reservoir, by a conduit line of canals, pipes and a tunnel. But as we had a rapid development of water at that time (in 1887 and 1888), we then selected the source which could be brought in quickest, and so the company decided to bring in the Alameda Creek water first, by the way of the Belmont pumping works. The waterworks of Pilarcitos, San Andreas and Crystal Springs, when eventually completed, will be capable (inclusive of Portola reservoir and Lake Merced) of containing 57,000,000,000 gallons. Their present storage capacity is about 30,000,000,000 gallons. The proposed Calaveras reservoir is now practically all owned by the company. So is the San Antonio reservoir site and that in the Arroyo Valley. In the lower portion of the Sunol Valley there is a large bed of gravel of about 1,300 acres where I have built a large concrete tunnel and put in side pipes, and we are filtering the water out of a prehistoric, but now subterranean, lake, and we are drawing from there and this natural filterbed an average supply of about 14,000,000 gallons a day of filtered water. We also own artesian properties here partly developed, which water is also sent to Sunol Valley and is included in the above 14,000,000 gallons daily.

The three above proposed storage reservoirs on the Alameda Creek system will have, when completed, a joint storage capacity of about 50,000,000,000 gallons. They will pour their waters onto the Sunol filterbeds. The water will sink into this large gravel basin, of about two square miles area, and will be drawn out again from the bottom of this large natural gravel filter by the concrete filter gallery. The watersheds tributary to these three large reservoirs have a joint area of about 320 square miles. After being thus thoroughly filtered the water will run, via the Sunol aqueduct, to San Francisco, Oakland, Alameda, Berkeley and other cities. Eventually we propose to build a tunnel across and underneath the bay at Dumbarton Point. By borings, we have found a bed of clay 95 to 100 feet thick, below the bay, which appears to be continuous, the top of the same being about 100 feet below high tide, and the bottom about 200 feet.

The Sunol filterbed, containing about 1,300 acres of gravel, has a peculiar automatic action regarding self-cleansing, as at the beginning of the rainy season the floods wash out and scour and cleanse the upper strata of the gravel and rush the muddy waters into the bay, while the water sinks into the gravel, percolates through the same, and filters into the galleries.

The Hetch-Hetchy proposition lies at a distance of from 150 to 200 miles from the city. For 16 miles more or less the Hetch-Hetchy or Lake Eleanor water will run along the river bed and be taken up in an open ditch for some 15 to 30 odd miles (which includes tunnels, and pipes of iron) to two power stations that they propose to build for the development of electric power there—a part of which power is supposed to go to the farmers in the Modesto and Turlock irrigation districts, and a part is to be used at the city's proposed pumping station at Tracy, and the rest in San Francisco. The water pumped at Tracy will have to be forced over Livermore Pass, which is about 740 feet above tide. By the Garfield agreement, the farmers are going to have their water rights guaranteed of 2,350 cubic feet of water per second, or about 1,520,000,000 gallons a day, before the city can draw any water from the natural flow of the Tuolumne River.

From the tail race of the second proposed city power station, the city's double pipe line is to follow the line which is shown on the accompanying map, crossing the San Joaquin River with submarine pipes, then discharging at the proposed Altamont pumping station, near Tracy, at an elevation of about 180 feet above tide. There the pumps will elevate it to 740 feet above tide to the summit of Livermore Pass, and from there it will flow, by gravitation, through the double pipe line, largely following the crooked county road, then through the Spring Valley Water Company's property, past our reservoir sites there, over the company's Sunol filterbeds, crossing the hill back of Mission San Jose by a tunnel; then turning southwardly towards Alviso, following around the edge of the marsh and around the bay, if possible always on the county road so as to save the great cost of rights-of-way; then following along the Santa Clara and San Mateo county roads to the San Francisco county line, near which the water is to be sent through a long tunnel near Ocean View and discharge into a reservoir near the Industrial School, which is about 200 feet above tide. From there the city is to be supplied, the lower part of the city direct, and the rest of the water is to be lifted up by electrically-driven pumps. Near Belmont a relief reservoir is planned, but the purchase of the land will be very costly. Besides, this reservoir is located at too low an elevation, and the water from it cannot be run from there to San Francisco by gravitation through the city's proposed Hetch-Hetchy pipe lines.

Northwest of the Hetch-Hetchy region there is the Stanislaus River, with a watershed similar in area to that of the Hetch-Hetchy. North of this again is the Mokelumne River, with also quite a large watershed. The above short outline shows that the problems that are to be solved by the engineers that are going to undertake this work for the city; that is, not only build large storage reservoirs in the Sierra Nevada, but also the conduits for conveying the water, first through an open ditch, tunnel and pipe line for a number of miles along the steep bluffs of the Tuolumne canyon, and then through about 135 miles of double 48-inch pipe lines, with its great power and pumping stations and electric power lines, will have a tremendous task before them after the order has been given to go ahead and the 270,000,000 pounds of first-class American laminated plate-iron have been ordered.

The clear diameter inside of the small course of

the pipe being 48 inches, it is expected by the city engineers to carry, with about six feet fall to the mile, a maximum of in the neighborhood of 30,000,000 gallons a day. There being only two pipes in the city's program, the people are told by the promoters that this water conduit has a capacity of 60,000,000 gallons a day. I do not agree with them, because there is no safety factor in this line. It consists of only two pipes, each of a daily maximum capacity of 30,000,000 gallons. We know from experience that the daily consumption during the warm spells, in summer and fall, increases over the annual daily average from 15 to 20 per cent. That excess draft is not allowed for in the city pipes. Practically, therefore, these two pipes can be rated only at about 50,000,000 gallons a day average, as the difference between the 50,000,000 and 60,000,000 represents the margin for the excess draft in the warm periods. So far the absolutely necessary third, or safety pipe, has not been advised by the advocates of the Tuolumne project.

Our company's taxes have increased enormously on account of the increased value of the property, and still, in the valuation by the so-called experts of the city, we are not allowed for the increase in value when it comes to water rate fixing. The payments made to the company by the city for water supplied to the city for all municipal purposes were made with the understanding that they should approximate the amount of the taxes annually paid by the company. If the taxes were to be raised the water rates paid by the municipality were to be so proportioned as to provide for the higher taxes, and the consumers' water rates were to provide sufficient income for interest on the capital invested, and for the operating expenses.

The following table gives the manner in which the city carried out its part of the program. It will be noted that, up to the incoming of the new charter in 1900, the municipality faithfully and fairly carried out its part of the tacit understanding, as the supervisors fully appreciated that in the absence of a separate and independent fire protection system in San Francisco, it was imperative that the company should be assisted by the municipality in doing everything in its power, jointly with its domestic supply system, to also incidentally improve the fire pipe and hydrant system:

Year.	Taxes paid by the Spring Valley Water Company	Receipts from the City for water supplied to the municipality and for hydrants for fire tection.
1890	$ 86,446.00	$103,336.00
1895	102,156.00	137,236.00
1900	226,660.00	225,977.00
1902	236,829.00	161,402.00
1904	365,497.00	93,104.00
1906	279,994.00	65,112.00
1908	319,739.00	114,253.00

This table needs no further comment, as it shows plainly how the power conferred upon the supervisors by the new constitution, and particularly by the new charter, was and has been interpreted ever since 1900, thereby crippling the efficiency of the company's tanks for fire protection.

We don't know as yet who will build the Tuolumne works for the city. They will probably be appointed by the Mayor. But, no matter who will be selected, from my experience in a great variety of large works constructed, I cannot but say that the city has a tremendous problem to solve. The people of this city haven't the faintest idea of what is before them. I have placed myself on record not only as to the certain consequences of the city's past action towards the water company, but also as to the difficulties that will be encountered and the vast expenditures that the city will have to incur, far beyond the estimates furnished by their official advisers. In the first place, their estimate on the daily consumption is far too low. Instead of the two pipes, they will have to lay three pipes. Each pipe complete, if properly built, will cost between $13,000,000 and $15,000,000, if made of first-class American laminated wrought iron. I think it has been estimated for the city at somewhere between $9,000,000 and $10,000,000. There are between $39,000,000 and $45,000,000 for the three pipes alone. You have to build canals, tunnels, power plants and pumping stations; then you have to have a distributing pipe system for $9,000,000 or $10,000,000 in San Francisco. You have to build your reservoirs in the mountains and in the city; to fight the farmers for water and water rights; rights of way have to be bought or condemned; lands and properties will have to be bought, etc., and that has all to be handled by the Board of Supervisors, which changes its personnel practically every two years.

If they had one independent competent board or commission, with full power to finish the entire project, as a private corporation would do, that might possibly do; but here are ten years that it will take to build the works, during which time there will probably be five changes of administration. Probably five Boards of Public Works will handle the project, each one with different ideas, and perhaps from three to five new sets of city engineers may be employed, and you can imagine what would be the final outcome of this pot pourri. I don't want to discourage it. They have gone so far already, that I am afraid they will inaugurate the work; but I have certainly done all I could, at least to warn the people.

The capital invested in the Spring Valley was derived principally from the sale of stock and bonds, and from assessments. The credit of the company with a fair treatment on the part of the Supervisors, and based upon the good and efficient works and upon the enormous land holdings that it owns would be very high. The unification of these properties into one compact unit adds largely to the value of these properties. As long as there was a reasonably fair interpretation of the new Constitution, as to a fair valuation and a fair revenue, money could be obtained for the extension of the works; but as soon as there was danger that there would not be sufficient money provided by the Supervisors to meet the necessary expenditures, then, little by little, the stock and the bonds began to depreciate. With a reasonable assurance on the part of the city of a fair, regular, constant income, there would have been a very much better feeling on the part of capitalists to purchase these securities, and, furthermore, a continued development of the works of the company would have been assured, as well as a gradual reduction in the cost of water to the consumers.

APPROVED ELECTRICAL DEVICES

CABINETS.

Cast metal cutout cabinet with iron door; for use with armored cables. Clamps provided inside cabinet for securing armored cable. Cat. No. 750. Approved Nov. 15, 1909. Manufactured by

Fancleave Specialty Co., Jamaica Plain, Mass.

Steel cabinets with or without gutters lined with slate or steel for panelboards and switches. Approved Nov. 15, 1909. Manufactured by

Milwaukee Vault & Electric Cabinet Box Mfg. Co., 54 Biddle St., Milwaukee, Wis.

"Security" Cabinets and Boxes. All-metal cabinets with tubs formed of one sheet for panel boards, switches and cutouts. Approved Nov. 19, 1909. Manufactured by

The F. Bissell Co., 226-230 Huron St., Toledo, Ohio.

CONDUIT BOXES.

"S. E. Co." For rigid Conduit, Cast Iron, Cat. Nos. 2520, 2521, 2525, 2526, 3001, 3002, 3003, 3004, 3005, 3006. For Flexible Steel Conduit or Steel Armored Conductors, Cat. Nos. 1904, 1905, Styles 5010-5044, 5140-5144, 505-5054, 5150-5154, 5211, 5212, 5220, 5221, 5224, 5225, 5250-5254, 5260-5264 (lined or unlined) Cat. Nos. 6234-6239 and Cat. No. 640 fiber flange. Stamped Steel, Cat. Nos. 6200, 6200 Straight Electric (219, 6220, 6221, 6222, 6225, 6225 Deep, 6231, 6231 Deep, 6249, 6250, 6300, 6350, 6350 Deep, 6350 N, 6399, 6399 Deep, 6400. Junction Boxes, Cast Iron, Cat. Nos. 2504-5214 (lined or unlined). Covers of Stamped Steel, Cast Iron or Porcelain suited for above boxes. Approved Nov. 11, 1909. Manufactured by

Sprague Electric Co., 527 W. 34th St., New York, N. Y.

FIXTURES.

"McCoy" Electric and Combination Fixtures. Approved Nov. 13, 1909. Manufactured by

McCoy & Sons, J. B., 114 W. 30th St., New York, N. Y.

Tungsten multi-light cluster. Approved Nov. 8, 1909. Manufactured by

American Arc Lamp Co., Kalamazoo, Mich.

Standard electric and combination fixtures. Approved Nov. 8, 1909. Manufactured by

The Horn & Brannen Mfg. Co., 427-433 North Broad St. Philadelphia, Pa.

FLEXIBLE CORD, PENDANT.

Tag on coil to read, "Nat'l Elec. Code Standard." Marking: One red thread in the cotton wind. Approved Nov. 8, 1909. Manufactured by

Detroit Insulated Wire Co., Wesson Ave. and Albert St., Detroit, Mich.

FLEXIBLE CORD, PORTABLE.

Tag on coil to read "Nat'l Elec. Code Standard." Marking: One read thread in the cotton wind. Approved Nov. 8, 1909. Manufactured by

Detroit Insulated Wire Co., Wesson Ave. and Albert St., Detroit, Mich.

LAMP ADJUSTERS.

Device consists of two lengths of steel wire sliding one on the other to provide the necessary adjustment. A special "locking" device automatically holds the lamp in the position desired. Clamps are provided for attaching the adjuster to the flexible cord. Approved Nov. 15, 1909. Manufactured by

H. Ruben, 2506 Third Ave., Rock Island, Ill.

PANELBOARDS.

Two-wire panelboards for 125 volts, with open link, cartridge enclosed, or Edison plug fuses in branch circuits. Two-wire panelboards for 250 volts; with cartridge enclosed fuses; with or without branch circuit switches. "Universal" panelboards, two and three-wire, 125, 125-250 and 250 V.; with rings formed in the branch bus bars as receptacles for Edison plug fuses or plug fuse casings. Approved Nov. 18, 1909. Manufactured by

J. Lang Electric Co., 423 N. Lincoln St., Chicago, Ill.

125 and 250 volt, 2 and 3 wire boards equipped with knife switches and terminals for cartridge enclosed fuses. Also 2-3 wire metering panel 125-250 volts when mounted in suitable slate lined cabinet. Approved Nov. 8, 1909. Manufactured by

Electric Manufacturing Company, 926 Lafayette St., New Orleans, La.

RECEPTACLES, MINIATURE.

"Bryant" ½ A., 125 V. Cleat types. Candelabra, Cat. No. 367; Minature, Cat. No. 366. Sign Receptacles. Candelabra, Cat. No. 25705; Miniature, Cat. No. 279. Approved Nov. 15, 1909. Manufactured by

The Bryant Electric Co., Bridgeport, Conn.

RECEPTACLES, STANDARD.

Wall sockets, Key 50 C. P., 250 V., Keyless 3 A., 250 V. Brass Shell. Key, Cat. Nos. 387, 455, 480, 62350 with composition keys, also 468 and 469 with metal keys. Keyless, Cat. Nos. 0387, 456, 481 and 62351. Porcelain Shell. Key, Cat. Nos. 107, 237, 247, 2371 and 100136. Keyless, Cat. Nos. 1087, 0237, 0247, and 02371. Approved Oct. 7, 1909. Manufactured by

Pass & Seymour, Inc., Solvay, N. Y.

SOCKETS, STANDARD.

"G. E." Brass Shell Sockets. Key, Cat. Nos. 1317, 1318, 9386, 44389, 50760, 99386, Electrolier, 29623, 29624. "Security Snap" 44147, 44148, 44151, 44814, "Multi-Catch" 59952, 59953, 59956, 59958, also lock type 58951. Keyless, Cat. Nos. 1319, 1320, 0392, 44390, 50768, 66237, 99392, Electrolier, 59596, "Security Snap" 44149, 44150, 44152, 44815, "Multi-Catch" 59954, 29955, 59957, 59959, also lock type 58957. Pull, Cat. Nos. 68009-68011 incl. Also all the above types with shadeholders attached. Approved Nov. 9, 1909. Manufactured by

General Electric Co., Schenectady, N. Y.

"Paiste" Brass Shell Sockets. Key, 50 C. P. 250 V. Cat. Nos. 9386, 18386, 43389, 49386, 50760, 99386, "Security Snap" 44147, 44148, 44914, "New Wrinkle," 59480, 59481 59484, 59496. Keyless, 3 A., 250 V., Cat. Nos. 9392, 19392, 43390, 49392, 50768, 99392, "Security Snap" 44149, 44150, 44815, "New Wrinkle" 59482, 59483, 59487 and 59485. Pull, 50 C. P. 250 V., Cat. Nos. 61120 and 61121. Also above types with shadeholders attached. Approved Nov. 9, 1909. Manufactured by

H. T. Paiste Co., 32d and Arch Sts., Philadelphia, Pa.

SOCKETS, WEATHERPROOF.

Johns-Pratt Company, Manufacturers, Hartford, Conn. H. W. Johns-Manville Company, New York, N. Y., Sole Agents. "J. P. Co." Composite sockets, "Moulded Mica" and "Black Compound," 3 A., 250 V. Pendant, Cat. 1140, 1149 and 60666. Bracket, Cat. Nos. 1143, 1144, 1150 and 1153. Approved Nov. 8, 1909. Manufactured by

Johns-Pratt Co., Hartford, Conn.

SWITCHES, AUTOMATIC.

"Bissell Security" Time Switches 25 and 50 amperes, 250 volts, 2 or 3 pole. A gravity opening switch mechanism operated by latching device and alarm clock movement mounted

on its slate base. Switch and clock enclosed in heavy cast iron case. Approved Nov. 19, 1909. Manufactured by

The F. Bissell Co., 226-230 Huron St., Toledo, Ohio.

Remote Control Switches, 25-1500 A., 125 or 250 V., opening and closing mechanism operated by solenoids. Single, double and three-pole types having laminated copper switch blades mounted on slate bases. Control circuits to be wired throughout according to Class C of the N. E. Code. Approved Nov. 23, 1909. Manufactured by

Sundh Electric Co., 115 Cedar St., New York, N. Y.

SWITCHES, COMBINATION CUTOUT.

Porcelain Base Switches with Edison Plug Cutouts. 15 A., 125 V., Cat. Nos. 1851, 1852, 1947 and 1982-1984 incl; 25 A., 125 V., Cat. Nos. 1695 and 1981; 25 A., 250 V., Cat. Nos. 1692-1694 incl. and 1985-1987 incl. Approved Nov. 15, 1909. Manufactured by

The Bryant Electric Company, Bridgeport, Conn.

Panel Cutouts with Knife Switch and Plug Fuses; Cat. Nos. 25028 and 25029, 0-30 A., 125 V.; Cat. Nos. 25030 and 25031, 0-30 A., 250 V. Entrance Cutouts with Porcelain Base, Knife Switch and Cartridge Fuses. Porcelain barriers provided between knife blades. Cat. Nos. 25050 2-pole, 31-60 A., 125 V. Cat. Nos. 25051 3-pole, 31-60 A., 125-250 V., three wire. Approved Nov. 17, 1909. Manufactured by

D. & W. Fuse Co., Providence, R. I.

SWITCHES, DOOR.

"C. H." Door Switches, 6 A, 125 V., 3 A., 250 V., with metal enclosing case with clamp for securing armored cable or flexible tubing. Approved Nov. 15, 1909. Manufactured by

The Cutler-Hammer Mfg. Co., Milwaukee, Wis.

SWITCHES, KNIFE.

Type "V" with porcelain bases. 15 A. and 25 A., 125 V., Cat. Nos. 1436-1441 incl., and 1454-1457 incl. Also unmounted switches 1442-1453 incl., 1460-1471 incl. Type "V" with slate bases. 15 and 25 A., 250 V., Cat. Nos. 1636-1641 incl., and 1654-1659 incl. Also unmounted switches, Cat. Nos. 1642-1653 incl., 1660-1671 incl. Panel Switch, 15 A., 125 V., Cat. No. 361, with or without extensions for open or cartridge enclosed fuses. Approved Nov. 15, 1909. Manufactured by

The Bryant Electric Co., Bridgeport, Conn.

Type C, 25 A., 250 V., single, double and four pole, and three-wire punched clip switches, mounted on slate bases. With or without N. E. Code standard cartridge enclosed fuse extensions. Approved Nov. 15, 1909. Manufactured by

Hoyt & Fruin, Cheshrie, Conn.

TRANSFORMERS.

Bell ringing transformers with primaries designed for connection to 110 volt A. C. lighting or power circuits. "Junior," supplying secondary voltage of 6 volts. Type A, supplying secondary voltage of 6 volts. Type B, supplying secondary voltages of 6, 14, and 20 volts. Secondary current on Types A and B limited by special resistance mounted in the transformer case. Approved Nov. 16, 1909, only for ringing bells and for similar signaling work and when primary wiring is installed in accordance with Class C of the National Electrical Code. Manufactured by

Thordarson Electric Mfg. Co., 216-220 S. Jefferson St., Chicago, Ill.

TRANSFORMER REGULATION.[1]

H. Y. Hall, Jr.—The paper for the evening covers a live subject and makes clear some points not as generally known as they should be, and sometimes not taken into consideration in the writing of the consumers' specifications or in the design of the transformers by the manufacturer.

The tests described were made under conditions which were made somewhat limited by the apparatus available. It is a pity that all commercial conditions cannot be manufactured in the laboratory. It seems that most of the tests were made on one bank of transformers at a time, under which conditions the voltage, unbalancing and phase shifting, would cause current unbalancing of only a small percentage of that obtained under some service conditions. One of the worst conditions to be met is on a system consisting of one or more large substations containing synchronous apparatus; the system being fed by a number of water-power and steam plants. Under such a condition, if one plant has a bank of transformers, the different units of which do not regulate exactly the same and which cause the legs of the voltage triangle to become unequal and distorted, then the current and wattage unbalancings in the different legs will be several times the percentage of the voltage unbalancing. Now, if the same station were connected to a circuit feeding lighting transformers or a similar load, the current unbalancing would be hardly noticeable.

Something over a year ago the speaker had occasion to investigate a case of current and wattage unbalancing in transformers installed in the Granite plant of the Utah Light & Railway Co. This station contained 2—375 k. w. transformers, "Scott" connected to transform from 500 volts, 2-phase, to 28,000 volts, 3-phase. The station fed into the Jordan substation high tension bus which was fed also by three other water-power plants, a steam plant and the Telluride Power Company. At anywhere near full load the main transformer (of the Granite station 2 to 3-phase bank), carried 15 per cent more load than the teaser transformer and at light loads the percentage difference was less. The main transformer is the transformer which is connected between the two legs of the 3-phase lines, while the teaser transformer is the one with the 86.6 per cent tap and is connected from middle tap of the main transformer to the other leg of the 3-phase line.

At no load, and at full load, under operating conditions, it was not possible to detect a voltage unbalance by means of voltmeter readings. The manufacturer of the transformers contended that the unbalance was due to the character of the load.

Due to the overheating of the main transformer, the station ran along a number of years, carrying less load than for which it was intended.

Owing to magnetic leakage, unbalancing is expected on core type "Scott" connected transformers in which the windings are not properly interlaced, but it is not usually anticipated in shell type transformers.

After studying the subject and brushing up on vector diagrams, etc., the writer came to the conclusion that the trouble was due, to a very small extent, to a natural difference in regulation of the main and teaser transformers, even if the windings were properly interlaced. The greater portion of the unbalancing was due to the current from the teaser transformer splitting, and half of its flowing in each direction through the main transformer. Due to the windings not being properly interlaced and there being a possibility of magnetic leakage, the magnetizing effect of 30° leading current in one-half and the de-magnetizing effect of the 30° lagging current in the other half did not neutralize each other and there was a shifting of the middle point of the main transformer voltage and a distortion of the voltage triangle.

It was necessary to write specifications for another bank of transformers. As we desired to get all we could out of the old transformers and as it was essential that the two banks operate satisfactorily in parallel, it was decided to use the two old transformers as teaser transformers, both being provided with 86.6 per cent taps, and it not being necessary to interlace the windings of a teaser transformer. Specifications were written to cover two main transformers with properly interlaced windings and with the same regulation as the old transformers when used as teaser transformers.

The two banks of mixed transformers have been in operation for several months and divide the load perfectly, it being impossible to tell any unbalancing on ammeters or wattmeters.

[1]See this journal, Nov. 20, 27, 1909.

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The President's Message

The predominating feature of President Taft's message to Congress is its length, which is justified by the wide range of topics with which it deals. Its most important recommendations are those dealing with the necessity for economy in the conduct of public affairs. Several matters of interest are left for later special messages. Among these are the intimation of legislation regarding the conservation of natural resources.

"In several departments there is presented the necessity for legislation looking to the further conservation of our national resources, and the subject is one of such importance as to require a more detailed and extended discussion than can be entered upon in this communication. For that reason I shall take an early opportunity to send a special message to Congress on the subject of the improvement of our waterways, upon the reclamation and irrigation of arid, semi-arid and swamp lands; upon the preservation of our forests and the reforesting of suitable areas; upon the reclassification of the public domain, with a view of separating from agricultural settlement mineral, coal and phosphate lands and sites belonging to the Government bordering on streams suitable for the utilization of water power."

This is one of the most vital problems confronting Congress, and upon its settlement depends the life of a number of contemplated hydro-electric developments. Its importance certainly warrants a special message, as does also the question of corporation regulation.

The concluding sentences regarding the general prosperity throughout the country and the probabilities of its continuance are encouraging. The message is characterized by no startling or revolutionary statements. It gives a mirror view of existing conditions which are but emphasized by their reiteration.

Hermann Schussler

In this week's issue by picture and text Mr. Hermann Schussler, consulting engineer for the Spring Valley Water Company, summarizes a life work which stands as a monument to his indefatigable energy. There is no detail in the vast ramifications of this great water system which was not personally supervised by him. It was he who built the dams which, though directly in the line of the great earthquake fault, yet stand unharmed. He it is also that laid the great submarine pipes which carry water under San Francisco Bay from Alameda County. So absorbing has been his work that it is but recently that he has taken time to describe its details. At the November meeting of the San Francisco Section of the American Institute of Electrical Engineers Mr. Schussler gave a brief history of the inception and construction of this system, the stenographic report of which forms the basis for the text we publish.

This will be interesting not only on account of its engineering features but also as a typical illustration of the many difficulties with which a public service corporation must contend. The masterly manner in which these were met form an inspiring example of what may be accomplished by that homely quality known as "grit." Incidentally, the combination of executive ability and engineering skill which it displays has brought to Mr. Schussler world-wide recognition.

CURRENT COMMENT

A new Tesla wireless system, employing the earth instead of the air as a conductor, is under test by Nicholas Tesla at Shoreham, Long Island, New York.

A solder for aluminum, consisting of tin, 49.05 per cent, antimony 3.43 per cent, lead 26.06 per cent, zinc 20.31 per cent and copper 1.10 per cent has been patented by Louis Goppman of Pittsburg.

A flat rate for porch lights has been established by the Los Angeles Gas & Electric Company. A charge of 70 cents per month is made for an 8 c. p. light burning all night on the porches of private residences. This light is a protection against burglars.

An increase in the price of platinum is contemplated by Russian producers, who furnish 95 per cent of the world's production. The price at present is from $27 to $27.75 an ounce for refined metal, and from $30.25 to $31.50 for hard metal.

The first Norwegian single phase railway was recently put in service between Thamshaven and Lokken. Three phase current is generated at 15,000 volts at a hydro-electric plant near Thamshaven and subsequently converted to single phase, 6,000 volts.

Government control of wireless communication is sought in a bill to be introduced in the French chamber of deputies to prohibit the employment of any radio-telegraphic apparatus on French territory without state authorization. Heavy fines are to be imposed in the case of persons receiving and divulging radio-telegraphic or radio-telephonic messages.

Trans-Atlantic picture transmission is to be the next stride in that branch of electricity concerned with telegraphy. The methods of Korn as described in this journal two years ago is to be applied to the Atlantic cable. Before the Royal Society of Arts in London Thorne Baker stated that he had obtained promising laboratory results on wireless transmission of pictures by means of his telectograph.

A depth indicator for bore holes has been devised by Prof. G. N. Lewis and Dr. H. T. Kalmus of the Massachusetts Institute of Technology. The pressure gauge proper is a very thin hollow rectangular tube, about one thirty-second of an inch thick, three-fourths inches wide, and eighteen inches long. This tube is made from a thin strip of carefully tempered steel, the edges being welded together in the oxyacetylene flame. This tube is closed at its bottom end and a piece of glass tubing of uniform bore is sealed to the upper end. The gauge is filled with mercury to a level marked on the glass. It is evident that when the gauge is lowered the pressure on the steel tube forces the mercury up and out of the tube, overflowing into an air tight chamber provided at the top. When the gauge is raised and the pressure decreases the mercury falls in the tube and its height can be read. The instrument has been calibrated by enclosing it in a steel tube filled with oil and connected with an ordinary oil pressure pump.

A primer on explosives is to be published by the United States Geological Survey. While it is intended primarily for the coal miner it will also be of interest to all who handle or use explosives. The use of explosives is increasing both in quantity and in the variety of purposes to which they are applied. They are now made at no less than 150 plants in different parts of the United States, and the annual product approaches 500,000,000 pounds. Of all this material there is no such thing as a safe or safety explosive when in the hands of a careless or ignorant person. This statement is true whether considered in connection with the transportation or use of these explosives in engineering. In addition to the large losses of life and property resulting from an improper use of explosives in mining, the recent statistics of the Railway Bureau for the Safe Transportation of Explosives have shown more than 400 persons killed or injured and over $3,000,000 worth of property destroyed from accidents from this source. The fact that through co-operative effort under the wise supervision of this bureau during the three years of its existence these losses have been reduced to almost nothing should encourage the hope that similar co-operative effort may likewise greatly reduce losses of life and property from the use of explosives in mining.

Electric distillation of turpentine at Vancouver, B. C., according to Consul-General George N. West, is carried on by a company who claim to obtain from selected mill refuse six to eight gallons of turpentine per cord treated. They have, however, secured a much larger return from wood obtained from other sources, such as very resinous woods, that are not fit for mercantile lumber—much of the Douglas fir grown in this province is cut leaving a stumpage of six to ten or more feet on account of the base of tree being very resinous. Then, too, trees growing at higher altitudes or those that have been wind twisted have very resinous bases; in fact, are unfit for mercantile use as lumber. The turpentine has been pronounced by leading authorities in the world as chemically pure and is superior to the article generally sold, which we have found by analysis to be largely adulterated. They estimate the cost of erecting a mill at $1,500 per cord to be treated, after making liberal allowances for contingencies, and estimate that it would take 12 men to operate a 10-cord mill, consisting of four North Americans and eight Orientals. The pay of the former labor averages from $2 to $3 per day and the Oriental about 20 cents per hour. At present there is only one mill in operation in the world under these methods. The present wholesale price of turpentine in Vancouver is $8.10 per cask, but consumers are willing and anxious to pay a little more than the market price. The by-products, tar, oil, rosin, pitch and charcoal, all find a ready market, the rosin especially being in great demand for use in the manufacture of cheap soap.

PERSONALS.

James Hunt, of Hunt, Mirk & Co., returned to San Francisco from the East this week.

R. J. Russell, secretary of the Century Electric Company of St. Louis, was in San Francisco this week.

F. L. McGillan of the California Pole and Piling Company, has returned to San Francisco from a trip north.

F. F. Lacks assumed the management of the San Francisco office of Arthur Koppel Company on December 1, 1909.

C. R. Wallis, formerly of the General Electric Company's Cincinnati office, has joined the San Francisco sales organization.

W. J. Davis Jr., Pacific Coast engineer of the General Electric Company, has gone south for a two or three weeks' trip.

G. I. Kinney, manager of the Fort Wayne Electrical Works, San Francisco, has returned from a short trip to Los Angeles.

H. A. Russell, manager of the San Francisco sales department of the General Electric Company, was in Los Angeles last week.

R. C. Peck, incandescent lamp specialist of the General Electric Company of San Francisco, is in Los Angeles on a business trip. He will return in about a week.

Allen P. Eldred, formerly with the San Francisco office of the General Electric Company, is now with Pike & Lebenbaum, electrical manufacturers' agents, of San Francisco.

R. W. Otto, formerly of the Western Electric Company and more recently of the Manhattan Electrical Construction Company, has joined the sales force of the Pacific States Electric Company.

P. H. Coolidge, assistant general manager of the Pac. T. & T. Company, is on a tour of inspection of the new pole line crossing the Tehachapi Mountains. This new line is but one of many improvements and extensions leading to good service.

Frank E. Dunbar has been appointed manager of the San Francisco office of the Direct Line Telephone Company. B. Darrach, manager of the New York office, who has been in San Francisco for some time looking after the business of the company, will return East early in January.

TRADE NOTES.

The Standard Electric Construction Company of San Francisco have the contract for the electrical work in the St. Francis Hospital at Hyde and Bush streets, San Francisco.

J. O. Thomas of the Eugene, Oregon, Electric Company, has sold his stock of electrical supplies and fixtures to the Warren H. Lane Company of Roseburg. The stock will be shipped at once to Medford, Oregon.

The Electric Storage Battery Company announces a change in management of their Southern sales office. Mr. H. H. Seaman, the former manager, having resigned, Mr. A. N. Bentley has been appointed to take charge of this office. Mr. Bentley has had a comprehensive storage battery experience as the engineer of their Cleveland office.

The Bear Lake Power Company of Montpelier, Idaho, has recently placed an order with Allis-Chalmers Company for the following transformers: 3-100 k. v. a. 6600-2200 volt (O. F. S. C.); 3-50 k. v. a. 6600-5000 volt auto-transformers; 9-15 k. v. a. 2200-220 volt Type A. L.; 2-10 k. v. a. 2200-220 volt Type A. L.; 3-5 k. w. 6600-220 volt Type A. S.; 4-2 k. v. a. 6600-220 volt Type A. S. and 2-5 k. v. a. 2200-220 volt Type A. L.

The Alumium Company of America, Pittsburg, Pa., has recently received an order from the Hydroelectric Commission of Ontario for 1.500,000 pounds of aluminum wire. This company has recently declared a 500 per cent dividend on its capital stock of $3,200,000. In 1908 the entire production of the American Aluminum Company, which controls the bauxite beds of Arkansas, Georgia and Alabama, was 8,200,000 pounds.

The General Electric Company have received an order from the San Diego Electric Railway Company for two General Electric, type 202, 50 h. p., 600 v., two motor equipments, with K.-11-H. controllers. The Fresno Traction Company have ordered ten General Electric, type 88 B., 40 h. p., 500 v., two motor equipments with K.-10 controllers. San Pedro, Los Angeles and Salt Lake Railroad Company have placed an order with the General Electric Company for three 25 k. w., 125 v. Curtis turbine sets for train lighting, to be installed in baggage cars.

The Bear Lake Power Company of Montpelier, Idaho, are adding to their facilities and have purchased the following equipment from Allis-Chalmers Company: One hydraulic turbine, operating under an effective head of 350 feet, delivering 920 b. h. p. normally and a maximum of 1180 b. h. p. The water is delivered through a pipe line 1500 feet long, with a diameter varying from 40 to 36 inches. The turbine will be direct connected to a 650 k. w., 6600 v ., 60 cycle, three phase, 12 pole alternator and governed by a size 11 Allis-Chalmers oil pressure governor. Excitation will be by means of a 15 k. w., 120 v., 1100 r. p. m. belted governor.

A collision occurred on the Pennsylvania and Jersey City Railroad at Jersey City, on the morning of November 6, 1909, resulting in the death of five persons and injury of twenty or more, and doing much damage to an engine and cars. One of the steel passenger coaches jumped the track, and turned over on its side, denting the steel plates about eighteen inches in places. This car contained, among others, one General Electric tantalum lamp and nine General Electric tungsten lamps. One of the remarkable features of the accident was that after the wreck the tungsten and tantalum lamps were taken out and tested, and with the exception of the tantalum lamp, were found to be in perfect condition. This is a striking example of the durability of tungsten lamps in train lighting, and we no doubt will see in the near future all trains in this country equipped with these lamps.

NEW CATALOGUES.

Holophane Illumination for November illustrates new types of steel reflectors, describes scientific school lighting and gives valuable pointers on more efficient gas and electric lighting.

Bulletin No. 118 just issued by the Crocker-Wheeler Company of Ampere, N. J., describing small direct current motors, is well illustrated with halftone engravings, showing applications of Crocker-Wheeler motors to various types of machinery. It also contains interesting and valuable engineering information.

The functions of the Motor-generator set and the methods of choosing the motor-generator best adapted for each condition have been clearly outlined in Bulletin No. 116, published by the Crocker-Wheeler Company, of Ampere, N. J. There is also a considerable amount of interesting engineering information in this bulletin.

"Motor Drive in the Laundry" is the title of Bulletin No. 117 recently put out by the Crocker-Wheeler Company of Ampere, N. J. The application of electric motor drive to laundry machinery has brought about greater cleanliness, better light, saving in power, increased output, saving in repairs, greater comfort to employees and greater flexibility of location of machines.

NEWS OF THE STATIONARY ENGINEERS

PREAMBLE.—This Association shall at no time be used for the furtherance of strikes, or for the purpose of interfering in any way between its members and their employers in regard to wages; recognizing the identity of interests between employer and employe, and not countenancing any project or enterprise that will interfere with perfect harmony between them.

Neither shall it be used for political or religious purposes. Its meetings shall be devoted to the business of the Association, and at all times preference shall be given to the education of engineers, and to securing the enactment of engineers' license laws in order to prevent the destruction of life and property in the generation and transmission of steam as a motive power.

California.

No. 1. San Francisco, Thursday, 172 Golden Gate Ave. Pres., P. L. Ennor. Sec., Herman Noethig, 816 York St.

No. 2. Los Angeles. Friday, Eagles' Hall, 116½ E. Third St. Pres., J. F. Connell. Fin. Sec., Harry Notthoff, 1307 Winfield St. Cor. Sec., W. T. W. Curl, 4103 Dalton Ave.

No. 3. San Francisco. Wednesday, Merchants' Exchange Bldg. Sec., David Thomas, 914 O'Farrell St.

No. 5. Santa Barbara. Geo. W. Stevens, 2417 Fletcher Ave., R. R. No. 2.

No. 6. San Jose, Wednesday. Pres., W. A. Wilson,. Sec., Lea Davis, 350 N. 9th St.

No. 7. Fresno. Pres., A. G. Rose. Sec., E. F. Fitzgerald, Box 651.

No. 8. Stockton. Thursday, Masonic Hall. Sec., S. Bunch, 626 E. Channel St. Pres., H. Eberhard.

Oregon.

No. 1. Portland. Wednesday, J. D. Asher, Portland Hotel. Pres., B. W. Slocum.

No. 2. Salem. A. L. Brown, Box 166.

Washington.

No. 2. Tacoma. Friday, 913½ Tacoma Ave. Pres., Geo. E. Bowman. Sec., Thos. L. Keeley, 3727 Ferdinand St., N., Whitworth Sta.

No. 4. Spokane. Tuesday. Pres., Frank Teed. Sec., J. Thos. Greeley, 0601½ Cincinnati St.

No. 6. Seattle. Saturday, 1420 2d Ave. Pres., H. R. Leigh. Sec., J. C. Miller, 1600 Yesler Way.

Practical letters from engineers and news items of general interest are always welcome. Write your items regardless of style. Communications should be addressed to the Steam Engineering Editor.

ANNOUNCEMENT.

Since this department, of especial interest to the steam man, was started in the spring of this year there have been published accounts of the various meetings of the N. A. S. E. and occasionally some of the papers there read have been printed. A few other articles on steam and its application have also appeared. Attention to this vitally important branch of modern engineering has, however, been spasmodic.

Encouraged by the marked appreciation and interest shown for this slight attention to the needs of the stationary engineer the "Journal" has taken steps to establish a regular department of steam engineering. The formal initiation of this service will begin with the new year.

We purpose:

First: To report regularly the accounts of all Pacific Coast meetings of the various branches of the N. A. S. E., and we take this opportunity to solicit prompt advices from the several secretaries. We welcome all papers and discussions the nature of which make publication advisable.

Second: We shall establish a Steam Engineer's Question Box, as a clearing house for troubles and for the general interchange of experience and ideas. To make this the thorough success which we desire it to become the hearty co-operation of all interested engineers will be necessary. Many periodicals conduct such a bureau of information and engineers are agreed in recognizing its value; but there is always felt the regret that the information so published is not classified for convenient future reference. Anticipating this need we are glad to say that by classifying the information along the line of the Dewey Decimal index system and including such classification as a supplement to the regular semi-annual Index of the "Journal," the diversified accumulation of valuable knowledge will be made easily accessible for quick future reference.

Third: It is intended to publish in the "Industrial" section, descriptions and cuts of appliances and devices which pertain to steam utilization. In this connection descriptions of steam installation and equipments will appear from time to time.

Fourth: For the young rising engineer as well as for the older interested men, it is intended to pursue a definite series of tales or lectures on sundry subjects pertaining to steam practice. These will be plainly written and as far as possible free from involved technical or mathematical expressions so that they may be readily understood and assimilated by the average reader without unusual effort. From time to time these will be supplemented by professional papers from prominent engineers.

With such a guiding outline we hope to merit the time and thought of that silent study class of men whose voices and efforts seldom reach the thronging daily life of the masses, but who are none the less vitally responsible, at one moment or another of each day, for the safety and convenience of each and every one of that same mass of unappreciative humanity.

SAN FRANCISCO NO. 1.

On December 2d, San Francisco No. 1, N. A. S. E., met for the first time in their new hall at No. 172 Golden Gate avenue, which is much larger and more commodious than our old quarters. Business of much importance was transacted, among which was the reading of the New License Bill and its unanimous adoption.

A committee of five was appointed to prepare a suitable entertainment for a smoker and house-warming to take place Thursday eevning, December 30th. The committee is A. T. Peery, H. W. Noethig, B. E. George, J. W. Maher and E. H. Kelly. J. L. Davis exhibited parts of a steam turbine which is in course of construction under his direction, and which proved of much interest to the members present.

CALIFORNIA NO. 3.

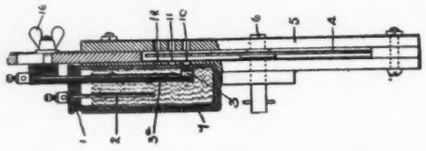
California No. 3, N. A. S. E., held an open meeting in the assembly hall of the Merchants' Exchange Building on Wednesday evening, December 1st. Professor W. F. Durand, Dean of the Department of Mechanical Engineering of Leland Stanford University, delivered a lecture entitled "Opportunities, Responsibilities and Training Necessary to Win Success in the Future Engineering Field." The subject was a broad one and Prof. Durand covered it in a most able manner. The professor was heartily applauded upon the conclusion of his lecture at which time Past State President H. D. Saville presented him (as a token of the esteem in which he is held by the members of the N. A. S. E.) with a suitably engrossed copy of California No. 3's souvenir album, which is descriptive of the havoc wrought by the great fire of 1906. The professor accepted the token and thanked the association in a few expressive words. The Educational Committee then announced that Prof. Durand's lecture would be published in this and other journals in order that others may benefit by his excellent advice. It was also announced that Hon. Bro. J. C. H. Stut, M. E., would soon favor the association with an address, the time and title to be given out in due time.

Robt. Hill, chief engineer of the S. S. Mariposa, and Chas. Johnston of the Golden Pheasant, were recently initiated and a number of applications are now on hand.

The General Electric Company has received an order from the Peninsular Railway Company of San Jose for the following equipment: One motor-generator set consisting of 1—MPC—4—300 k. w.—720 r. p. m.—600 volt d. c. generator direct-connected to 1—I—10—450 h. p.—720 r. p. m.—2300 volt a. c. motor and 4 type H—60—250 k. w.—11,000—2300 volt transformers complete with switchboards.

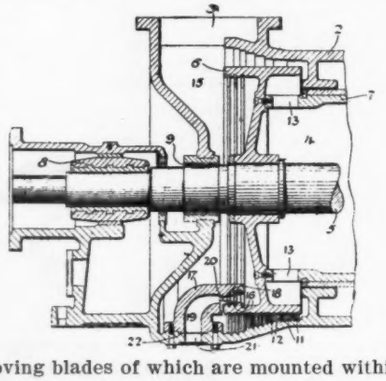
PATENTS

941,418. Slip Indicator. George A. Johnstone, Revere, Mass., assignor to General Electric Company. In a visual slip indicator for induction motors, the combination with a source



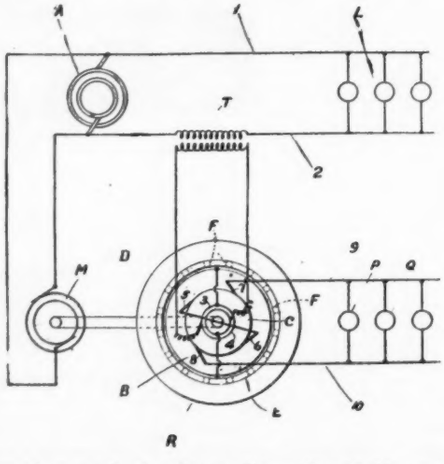
of light which varies in intensity in synchronism with an alternating current circuit, of means for exposing said source of light at intervals varying in frequency with the speed of an induction motor connected to the alternating current circuit.

941,396. Marine Turbine. George Westinghouse, Pittsburg, Pa. In combination with the low pressure drum or section of an ahead turbine, an astern turbine of the impulse



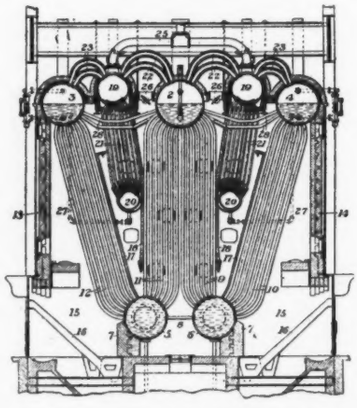
type, the moving blades of which are mounted within the drum of the ahead turbine and the intermediate guide vanes and nozzles of which are carried by a segmental bracket secured to the casing.

941,599. Means for Rectifying Single Phase Currents. Joseph L. Woodbridge, Philadelphia, Pa. In combination, an alternating current circuit, an armature with its appropriate windings and commutating provisions, means for producing



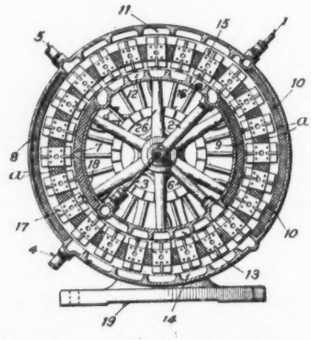
in the armature a single phase alternating field responsive to the current in the circuit, means for neutralizing one of the two revolving components of said field, means including a set of electrically interconnected brushes for producing a secondary field responsive to the unneutralized component of the first, means including a second set of electrically interconnected brushes for permitting a flow of direct current responsive to the secondary field, and means for producing relative rotation of armature and brushes in synchronism with the alternating current in the circuit.

941,820. Water Tube Boiler. James P. Sneddon, Barberton, Ohio, assignor to the Babcock & Wilcox Company, New York, N. Y. A vertical water tube boiler having firing openings at opposite ends, a pair of mud drums adjacent the firing openings, bridge walls protecting said mud drums, a central and a pair of outer steam drums having a common water level,



outer banks of tubes connecting the mud drums to the outer steam drums, a double bank of tubes connecting the mud drums to the central steam drum, baffles arranged between the banks of tubes and serving to direct the products of combustion from both ends toward the double bank of tubes and the central steam drum, superheaters arranged between the outer and double banks of tubes, and circulating connections between the superheaters and the steam drums.

941,826. Thermo-Electric Generator. John D. Taylor, Pittsburg, Pa. The method of thermo-electric generation, which consists in first heating a thermo-electric junction by causing the current to flow therethrough in a direction to liberate heat and raise the temperature of the junction to its upper limit, then reversing the direction of flow of current to



cause it to absorb heat from the junction, and replacing the heat so absorbed by external heat to maintain the junction at a substantially constant temperature, then causing the absorption of heat by the current to reduce the temperature of the junction to its lower limit, and finally again reversing the current flow and cooling the junction to maintain its lower temperature, these operations being repeated in a recurring cycle.

INDUSTRIAL

THE WESEL-WESTINGHOUSE ELECTRIC MATRIX DRYING TABLE.

In the daily race against time in the newspaper office, during the last hurried minutes before the paper is put to press, no appliance recently added to the printing plant equipment has worked such improvement in speed, reliability, convenience, cleanliness and comfort, as the electric matrix-drying table.

With it "mats" are dried in one-half to one-third the time required by older methods. The close control of the electric heat enables the temperature to be held accurately at the desired point. The controllers are mounted on brackets beneath the bed of the machine, convenient of access to the workman. A very large number of temperature gradations is available. The temperature is shown by an electrical thermometer, the indicator of which is mounted upon an adjacent wall or firm support.

The Wesel-Westinghouse Electric Matrix Drying Table.

The superior economy of electric matrix driers over those heated by steam, gas or other means, lies in the possibility of applying the heat directly to the work, the other parts of the bed being thoroughly insulated against radiation and conduction losses. As a result of this isolation of the heating element, the temperature of the stereotyping room is much reduced, and since its atmosphere is not devitalized from supporting combustion as with the gas-heated table, an improvement in the comfort, health and work of the operators has been many times demonstrated as the result of the electric matrix drier.

Combined with the greater pressure possible with the use of compressed air supplanting the effort of the hand-wheel, the high temperature of the electric hot-bed results in the production of matrices of greater sharpness and depth, and of superior printing quality. As noted before, the time of drying can be cut to one-half that of any other process, the actual amount depending, of course, on the quality of the work to be done. It is possible, however, to thoroughly "bone-dry" a matrix in less than two minutes, a speed of operation before considered impossible.

These electrically heated matrix-drying tables, for hand or compressed-air pressure, as manufactured by the F. Wesel Company, 70-80 Cranberry street, Brooklyn, N. Y., employ the well-known Westinghouse heating elements. They are in the service of some of the most progressive newspapers of the country, and have greatly improved the conditions usually found in the stereotyping rooms, besides effecting an important saving in the time of preparing the plates for the various editions. The resistance used has proven thoroughly reliable and permanent, and the expense of electrical operation with the Westinghouse heating element is unquestionably lower than by any other method, aside from its important advantages of temperature and convenience.

For use where the element of time is not so important in drying the matrix, a slower type of heating bed is supplied. Complete with heating elements, this bed is only two inches in thickness and is designed to be placed directly on the steam-heated bed, making a convenient source of heating quickly available without the delay or difficulty of resorting to steam heat. These electric beds for slow drying perform their service in about the same time as the gas or steam-heated beds, and with the same economy of the quick-drying unit.

A HIGH TENSION CONTACTOR PANEL.

A very desirable feature possessed by the electric motor as a source of power is the ease with which it lends itself to remote control.

The panel shown in the cut is designed to control a 750 h. p. 2080 volt squirrel cage type induction motor. This motor drives a centrifugal pump used in connection with a suction dredge to assist in forcing the material through pipes in order that it may be discharged at a distant point.

Due to the high voltage, the contactors for connecting the motor to the compensator and to the line after the starting period are oil immersed.

Fig. 1. Contactor Panel for 750 h. p 2080 Volt Induction Motor.

The motor and panel are located at a distance from the dredge and the panel is designed for control from the dredge, as there will be no attendant at the point where the motor is installed.

The overload device on the control panel is so connected that in case the motor becomes overloaded, the control circuit is opened at the dredge and this in turn opens the motor circuit by means of the contactors, thus making it possible in case of a temporary overload to start the motor again from the dredge.

In Fig. 2 the oil receptacle is lowered to permit inspection of the contactors.

This panel was manufactured by the General Electric Company at their Schenectady Works.

TWENTY-FOUR HOUR SERVICE AT APPLETON, MINN.

In the latter part of 1905 it was decided advisable to maintain a twenty-four hour service at Appleton, Minn., but it was found that the cost of operating their generating unit during the day would be prohibitive. They consequently installed a battery of "Chloride Accumulators" manufactured by The Electric Storage Battery Co. of Philadelphia, Pa., in January, 1906. This battery consisted of 128 cells with a capacity of 25 amperes for 8 hours.

A careful comparison of the records of this plant for the year preceding and the year following the installation of the battery was kept. This comparison showed that the installation of the battery effected an increase of fourteen per cent in the gross receipts of the company. Notwithstanding this increase in the output of the plant, the fuel actually consumed in 1906 was less than that used in 1905. The comparison further showed that after allowing the proper interest and maintenance charges on the battery equipment, a net return on the investment was shown of approximately fourteen

Fig. 2. Panel Showing Oil Receptacle Lowered to Permit Inspection of Contactors.

per cent. It should be borne in mind that this was the return effected by the battery in the first year of its service. At that time sufficient business had not been acquired to call for the complete output of the battery, as this business, however, has grown since then to the net return during 1907 and 1908 has naturally been greater. By being in a position to offer its customers light and power at any time, the Appleton Plant has been able to increase the number of customers as well as the actual plant output.

The East Pittsburg shops of the Westinghouse Electric & Manufacturing Company are beginning work on a heavy order for railroad motors for the Long Island Railroad, which represent almost a million dollars. This calls for 260 motors of 200 h. p. each, which will be used to equip part of the cars on the Long Island System, and is in line with the enormous development work the Pennsylvania Railroad Company is now doing in anticipation of the completion of the New York Terminals and tunnels under the North and East Rivers.

NEWS NOTES

FINANCIAL.

LOS ANGELES, CAL.—A second lot of bonds of the Mexican National Gas Company, amounting to $100,000 has been placed on the local security market.

NEWPORT, ORE.—At the Council meeting last week the 6 per cent bid on the $30,000 water bonds, together with $300 premium, of Morris Bros., of Portland, was accepted.

EL PASO, TEX.—An election will be held here on December 13th at which time voters will vote on the question as to whether or not municipal bonds shall be issued, that city may acquire the plant, properties and accessories of the International Water Company, the plant not to cost over $927,000.

INCORPORATIONS.

SEATTLE, WASH.—Seward Peninsula Power Company, capital $100,000, incorporated by Stuart Wheating, T. A. Davies and Wm. Gorham.

FRESNO, CAL.—Coalinga Light and Power Co.; capital stock $200,000. by R. D. Jones, R. C. Scott, H. W. Bedford, R. C. Esson and Louis George.

SEATTLE, WASH—The Holabird Electric Company has been incorporated by R. D. Holabird, E. J. Dwyer, C. A. Kilbourne, et al., with a capital of $60,000.

LOS ANGELES, CAL.—Inglewood Domestic Water Company, capital stock $125,000, subscribed in full, by C. Lloyd, W. Rodman, H. L. Martin, E. Floyd and J. Cook.

LOS ANGELES, CAL.—Stilvan Arc Light Company, capital stock $30,000, subscribed in full, by A. G. Morrow, L. E. Funk, E. K. Kellar, W. T. Stevens and A. G. Enslein.

SAN BERNARDINO, CAL.—Incorporated, Fontana Water Company, with capital of $300,000; place of business Rialto; to construct, operate and maintain artesian well pumping plant. Directors are: E. D. Roberts of San Bernardino, M. A. Hebard of Colton, Roy Bradley Wheeler of Los Angeles.

TRANSMISSION.

LOS ANGELES, CAL.—Sealed bids are being received by the Board of Public Works for furnishing the city one 75-horse power induction motor.

KALISPELL, MONT.—The Bitter Root Mountain Water Company has filed articles of incorporation, capital stock $100,000 by O. A. Farrar of this place et al.

LOS ANGELES, CAL.—The Board of Public Works will receive sealed bids up to December 13th for furnishing to the city one direct current 225-volt electric generator.

RHYOLITE, NEV.—Leonard Davis, general manager of the Buckeye Mill & Mining Company, at Fish Springs will put in an electric plant on Birch Creek to furnish power for the mill which is now being installed.

ALAMEDA, CAL.—The S. P. Company has commenced the erection of its new pole line on Pearl street, which is to be a feeder line for the new electric railroad system. The feeder line will connect the north and south lines of the electric loop and save the current traveling clear round the loop, with a consequent loss of power.

MERCED, CAL.—John Mason, superintendent of the Hite Cove mine on the south fork, states that the improvements already planned for the property of next year include the enlarging of the water power plant, the installation of a larger electric dynamo, and the sinking of the old shaft from the 1200 ft. level to the 1500 ft. level.

BISHOP, CAL.—Attorney I. B. Potter and President Chapelle of the Nevada-California Power Company, were in Independence for several days last month in the interests of a right of way through the valley for a transmission line from the Company's plant on Bishop Creek to Keeler. The company is planning an extension to Keeler.

CASTELLA, ORE.—E. C. Newell and J. G. Cunningham, leading stockholders in the Castle Lake Lumber Company of this place, have filed three water right locations aggregating 40,000 inches of the water running into Echo Lake west of Castella. The water is to be led through ditches and flumes to a point in section 1-38-6, where it will be used to develop electrical power.

ILLUMINATION.

TACOMA, WASH.—F. Brewer and W. W. Seymour of Aberdeen, have been granted a gas franchise for a term of 25 years by the City Council of Centralia.

LOS ANGELES, CAL.—The Board of Supervisors will receive sealed bids up to December 13th for furnishing to the East Hollywood Lighting District 200 electric street lamps.

SEATTLE, WASH.—Sealed proposals received by C. B. Bragley of the Public Works, for the installation of a complete system of cluster lights on Third avenue from Pike street to Virginia.

CHIHUAHUA, MEX.—The Guanajuato Light & Power Company has increased its capital from $6,000,000 to $12,000,000. This increase has been demanded on account of the extension of transmission lines and erection of new plants.

GEORGETOWN, WASH.—Georgetown is soon to have a $300,000 gas, electric light and power plant. Robert M. Jones, a Seattle attorney, representing eastern interests, has laid plans before the City Council and if a franchise is granted will begin work within the next twelve months.

HUNTINGTON PARK, CAL.—The City Council passed an ordinance calling a special election to be held on December 18th, submitting to the electors of city the proposition of incurring a municipal debt of $35,000 for the acquisition, construction and maintenance by the city of a gas plant for the purpose of lighting streets.

TRANSPORTATION.

CALDWELL, IDA.—It is reported that W. R. Sebree will build an electric line between this place and Nampa to cost $150,000.

EVERETT, WASH.—The Stone & Webster interests deny that they contemplate an interurban line between this place and Stanwood as recently reported.

GLOBE, ARIZ.—Stone-Webster Company is preparing plans for a street railway in Globe, with an extension of line to Miami and other large mining camps in this vicinity.

BOISE, IDAHO.—The Boise & Interurban Railway Company will make extensions to both its city and interurban lines the coming season.

TWIN FALLS, IDAHO.—Geo. F. Sprague, representing Milwaukee and other Eastern capital, is negotiating with the city authorities of this place with a view of constructing a street car system.

LOS ANGELES, CAL.—Bids will be received by the City Council up to January 4th for an electric street railway franchise on 39th from Vermont to Western avenue. This franchise was asked by John Howze and Robert Marsh.

WALLA WALLA, WASH.—The Northwestern Corporation has secured a 25-year franchise for the operation of an electric railway for power plant, etc. The remuneration to the city will be $54,000.

NEW WESTMINSTER, B. C.—Work has been started by Broley & Martin of Fernie, B. C., on the traffic floor of the Fraser river bridge. The floor will be replanked and paved with creosote wood blocks, the work to cost about $22,000.

LOS ANGELES, CAL.—An offer has been made to people of West Glendale and Burbank by L. C. Brand to build a line to connect with the Glendale-Los Angeles electric line at its terminus at Casa Verdugo. Mr. Brands wants a bonus of $30,000 and right of way.

SALEM, ORE.—A. Welch, president of the Salem, Eugene & Eastern Railway, was in the city recently and while here announced that work would immediately commence on the building of the main line between here and Eugene and that it will be well under way in 90 days.

VANCOUVER, WASH.—Construction work on the new electric line to be built by the Tum Tum Railway Company from Tum Tum mountain to Ridgefield, a distance of 45 miles will begin shortly after Christmas. A. Arnston is the general agent of the company.

PASADENA, CAL.—It has been given out in the local offices of the Pasadena Rapid Transit Company, that all right of way between this city and Los Angeles had been secured for the rapid transit line. The surveys have been completed and all that remains to be done is letting the contract.

LOS ANGELES, CAL.—The City Clerk will receive sealed bids up to December 28th for an electric street railway franchise commencing at the intersection of Heliotrope Drive and Melrose, thence westerly along Melrose avenue to Normandie avenue. The clerk will receive bids at the same time for an electric railway franchise beginning at the intersection of Ninth and Park View avenue, thence westerly along Ninth to Vermont avenue.

REDWOOD CITY, CAL.—A. H. Lohman, a civil engineer of San Francisco, has been making preliminary surveys for an electric line across the mountains to La Honda and the Big Basin. Engineer Lohman says that the eastern terminal of the road will be on deep water in the Redwood Creek, and it will run in a straight line to Woodside. It is understood that the chief backer of the proposed railroad is A. Schiling, who is associated with the Stauffer Chemical Company.

OAKLAND, CAL.—Application was made by the Southern Pacific Company to the Board of Supervisors this week for a franchise to extend its local service from Melrose to Stanley Road, the southern boundary of Greater Oakland. From this point, it is announced permission will be asked of the San Leandro officials to continue the line to the Hayward boundary and further application will be made to run the line from that point into Hayward. A double track will be laid and electricity will supply the motive power of the line.

OAKLAND, CAL.—The report is current that the Northern Electric will come into Oakland through Fruitvale. The Northern Electric Company announced some time ago that it was going to enter into competition with the Southern Pacific and Santa Fe systems for the interior traffic to the bay cities. As a first move a franchise has been obtained for a road from Sacramento to Benicia, which is now under construction. From Benicia, surveys have already been made for a road to cross the Carquinez straits from Adams Point to Bull's Head Point, above Martinez, in Contra Costa county, by means of a suspension bridge. Surveyors are now laying out a line from there through the Pacheco Valley to Concord, to Walnut Creek and then into Oakland by way of Redwood Canyon.

WATERWORKS.

LOS ANGELES, CAL.—Sealed bids will be received up to December 13th by the Board of Water Commissioners for 3,593 feet of 24-inch riveted sheet steel pipe.

WILLOWS, CAL.—The Northern California Power Company has awarded a contract to S. P. Sherfey of this city for digging 5.000 feet of ditch. The power company intends installing six-inch pipes in the ditches.

SANTA ROSA, CAL.—The Board of Supervisors has advertised for sale the franchise applied for by L. L. Lewis to run a water pipe line from his big reservoir for several miles through the adjoining district of El Varano.

SEATTLE, WASH.—The City Council has passed an ordinance for the improvement of West Sixty-fifth street, from Thirty-second avenue Northwest to Thirty-sixth avenue Northwest, in the city of Seattle, by laying water mains.

PHOENIX, ARIZ.—A large tract of land on Agua Fria River, west of here is to be developed by the Avondale Company, a local corporation, headed by C. B. King, with H. M. Lewis as manager. Six 16-inch wells are to be sunk to a depth of 300 feet.

NEWPORT, ORE.—A contract has been signed up with Engineer George Lea for the construction of a gravity water system for Newport; total cost, $30,000. Water will be taken from Blattner Creek, and the pipe will be furnished by the Portland Wood Pipe Company.

FREEWATER, ORE.—At the regular city election there will be presented the question as to whether or not the Common Council shall issue bonds for the sum of $10,000 for the purpose of providing funds to defray the expenses necessary to establish a water system.

SAN JACINTO, CAL.—Messrs. James L. and L. B. Turner of Hollywood have purchased 210 acres on Mountain avenue, and have let a contract to V. E. Proctor for a 10-inch well to be sunk 300 feet. If the well proves satisfactory another will be bored and pumping plant installed.

PORTLAND, ORE.—Sealed proposals will be received by the water board of the city of Portland, Ore., until November 9, 1909, for the furnishing and delivering at Portland, Ore.; 6000 lineal feet 48-inch pipe, 1680 feet 24-inch pipe; 1500 lineal feet 48-inch pipe, 420 lineal feet 36-inch pipe, including elbows and tees and "Y's,"

NORTH BEND, ORE.—A committee has been appointed by the North Bend Chamber of Commerce to prepare estimates for a water system. The total cost of the well system with sufficient capacity for a city of ten thousand inhabitants would cost $50,000. The committee has been ordered to continue its work and make a further report at the next meeting.

LONG BEACH, CAL.—Under an amicable arrangement the steel pipe purchased from a Los Angeles company by the Long Beach Water Company, will be taken back by the manufacturers and the company will lay its big main from the supply reservoir with cast iron pipe. Steel pipe could not be riveted tight enough at the joints to stand the pressure required.

HOOD RIVER, ORE.—The City Council has passed an ordinance issuing water bonds for $90,000 to be used in the construction of the municipal water system. Bonds are in the denomination of $100 to $1000 each, to draw interest at 5½ per cent, bids called for to be submitted January 28th, and to be accompanied by a certified check for $1,000. City Engineer Morse has been directed to run the lines which would be followed by the pipe lines to the city and to make complete surveys covering the whole system, so that the information will be at hand and the contracts could be let as soon as the bonds are sold.